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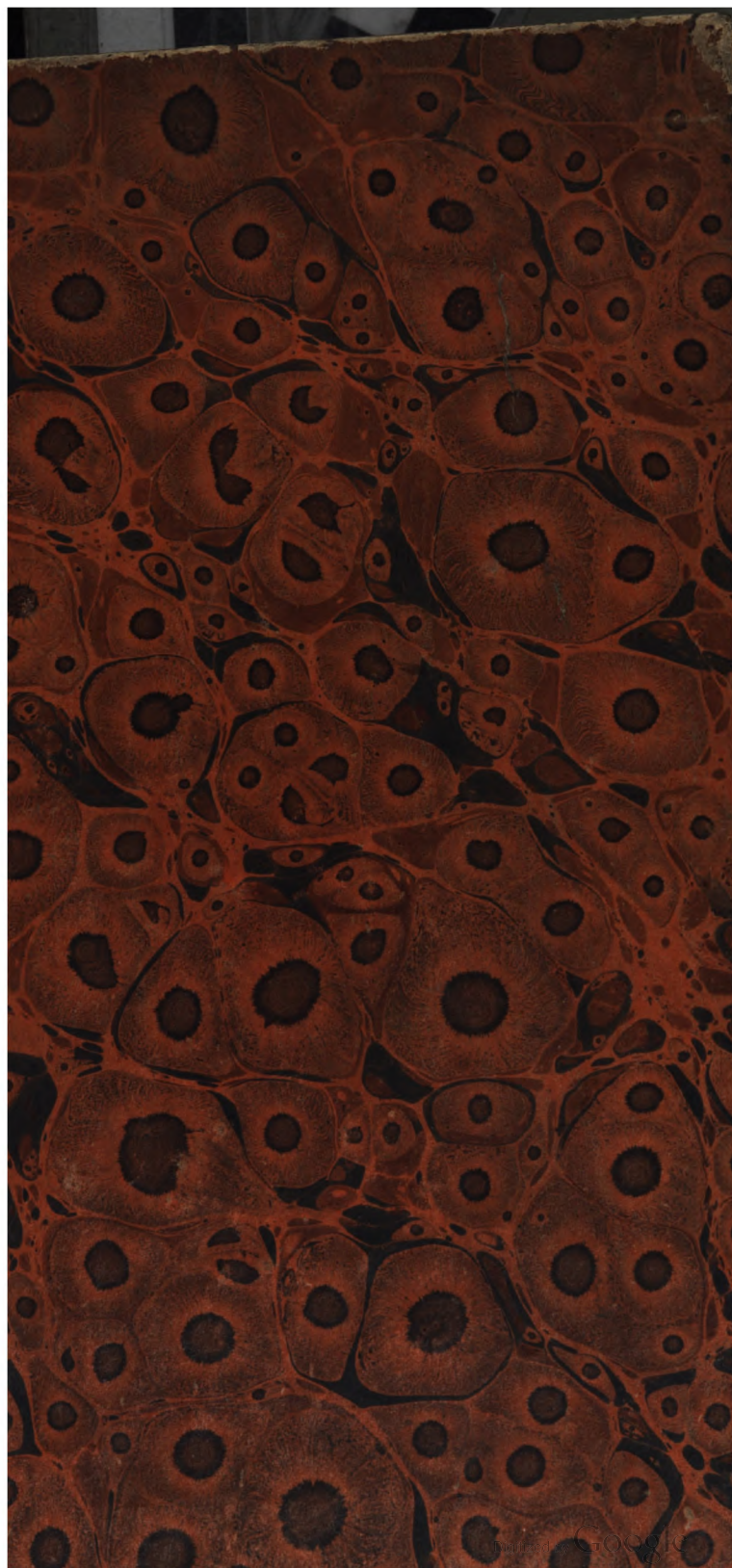
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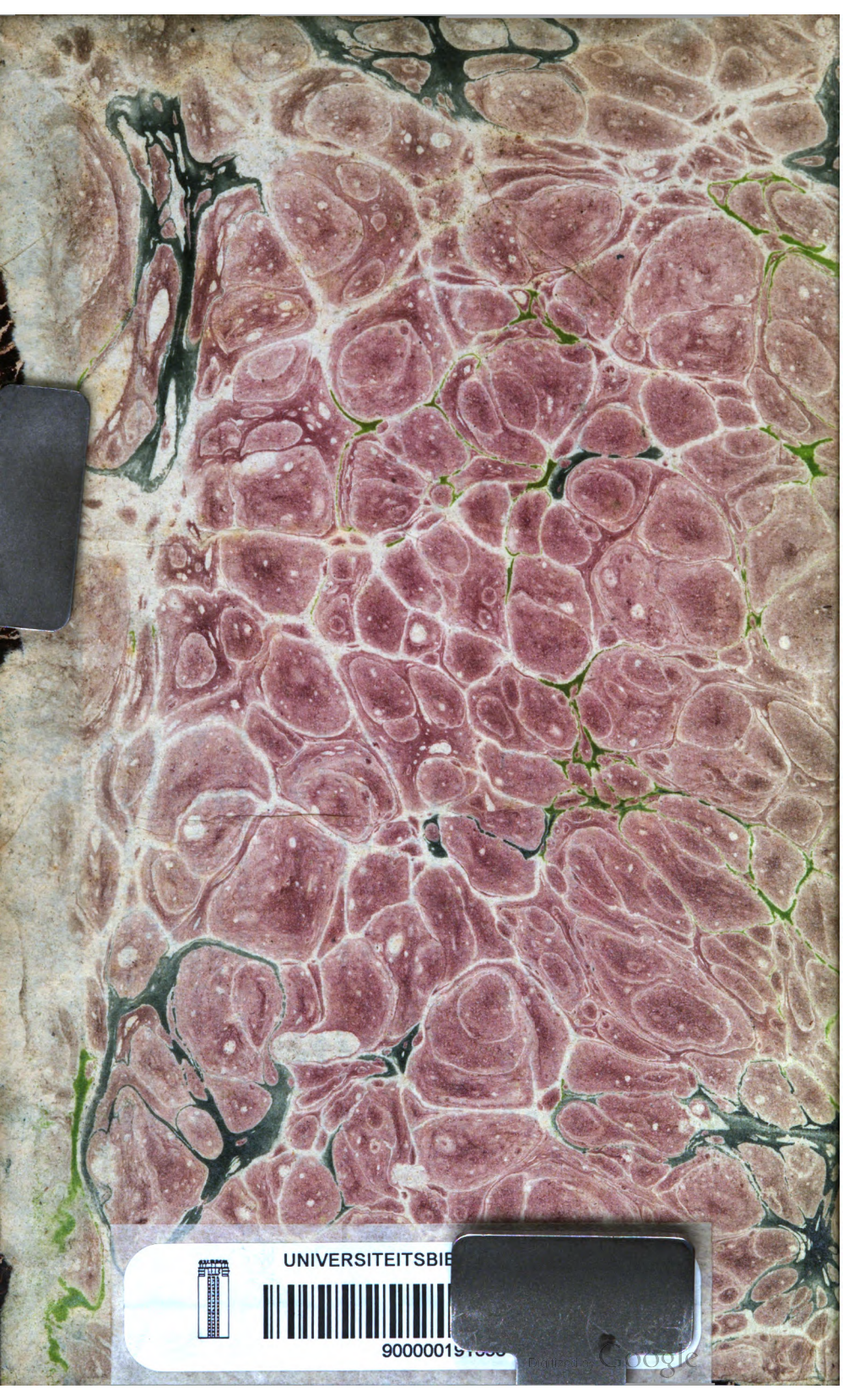
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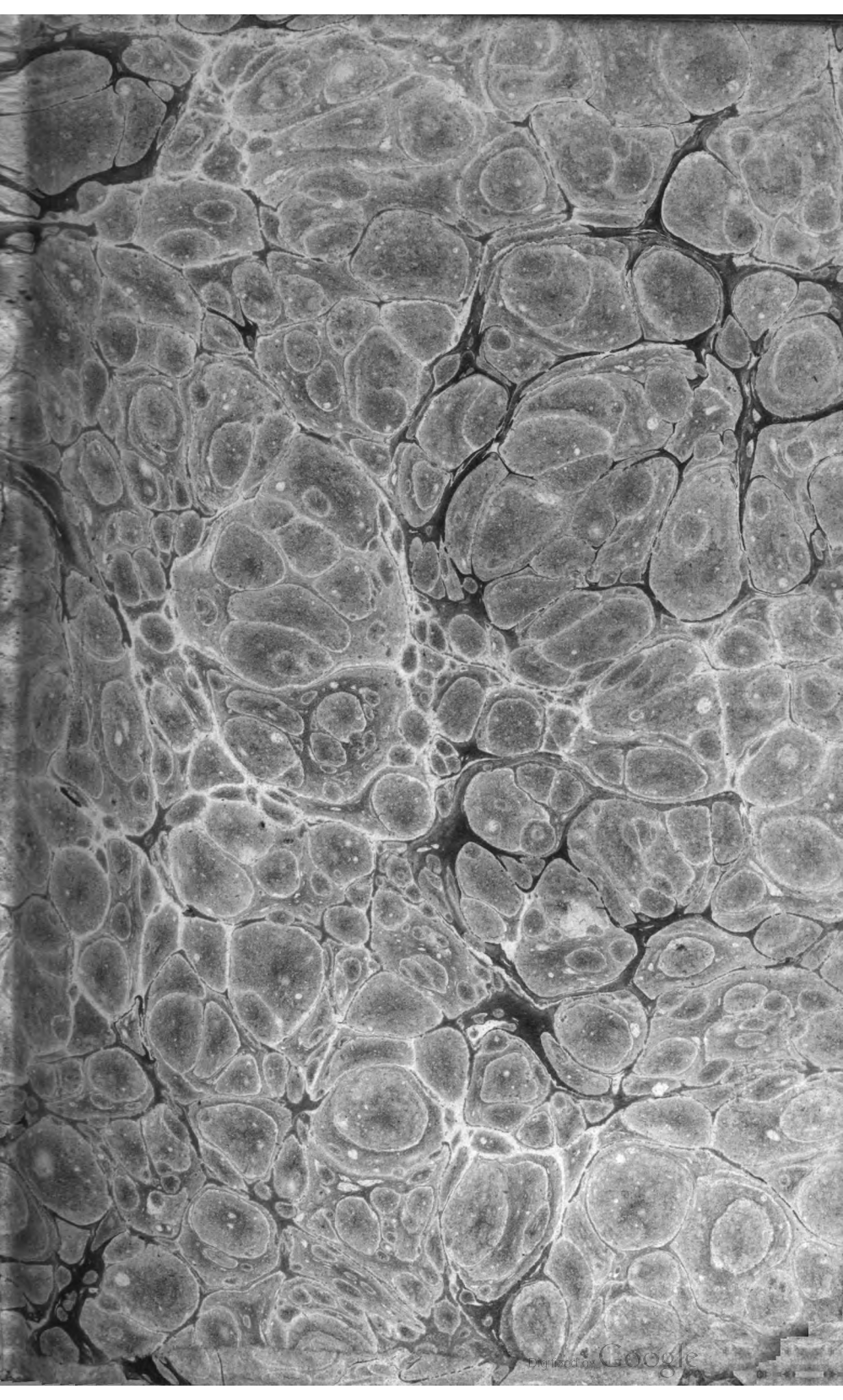


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THE
FIRST LINES
OF THE
PRACTICE OF SURGERY:

DESIGNED AS
AN INTRODUCTION FOR STUDENTS,
AND
A CONCISE BOOK OF REFERENCE FOR PRACTITIONERS.

VOL. II.

THE FOURTH EDITION,
CORRECTED AND ENLARGED.

WITH SEVERAL NEW COPPER PLATES.

By **SAMUEL COOPER,**

LATE SURGEON TO THE FORCES;

MEMBER OF THE COLLEGE OF SURGEONS, OF THE MEDICAL AND CHIRURGICAL SOCIETY
OF LONDON, AND OF THE MEDICAL SOCIETY OF MARSEILLES, &c.

LONDON:

PRINTED FOR LONGMAN, HURST, REES, ORME, AND BROWN; J. MURRAY;
HIGHLEY AND SON; COX AND SON; J. CALLOW; T. AND G. UNDERWOOD;
G. AND W. B. WHITTAKER; ANDERSON AND CHASE; BURGESS AND HILL;
AND FOR A. BLACK; STIRLING AND SLADE; FAIRBAIRN AND ANDERSON,
AND P. BROWN, EDINBURGH.

1820.

Printed by A. and R. Spottiswoode,
Printers-Street, London.

PREFACE

TO

THE SECOND VOLUME,

FOURTH EDITION.

THE greater part of this Volume consists of observations, which have been collected since the last edition of the Dictionary of Practical Surgery: to the subjects treated of in that work, they form essential additions, while they complete, as far as my present leisure enables me to do, a publication, more particularly designed as an introduction to surgery. However, in order to avoid repetitions, and make room for new matter, I have now omitted a few topics, of which I had no very different views to offer from those comprised in the Dictionary; nor shall I in any future edition of the latter book presume to describe again various interesting suggestions and modes of practice now inserted in the present volume. The remarks on exomphalos, cystocele, and some other cases of hernia, compose a very necessary supplement to the cursory account given of these diseases in the Dictionary; and the same may be said, with respect to the chapters on hydrocele, cirsocele, sarcocele, castration, phimosis, paraphimosis, amputation of the penis, strictures, puncturing the bladder, retroversion, inversion, prolapsus, and polypi of the uterus. With the account of lithotomy are incorporated a series of valuable observations, originally made by two modern surgeons of great eminence on the continent, Klein and Langenbeck, whose particular sentiments

upon this important operation have not yet been noticed in any English publication, with which I happen to be acquainted. The rules, which these authors have laid down for the performance of lithotomy with a knife, are founded upon the basis of anatomy, the only safe and certain guide, and are marked by a degree of precision and perspicuity rarely accompanying the directions, which other practical writers have given upon the same subject.

In the chapter on fractures, the reader will find a description of a very superior apparatus for the treatment of the broken neck of the femur. For this invention, which is remarkable, as well for the simplicity of its principles, construction, and application, as for its efficacy in keeping the limb constantly in the most eligible position, the profession are indebted to the ingenuity of Hagedorn, the contents of whose valuable treatise on Fractures of the Neck of the Thigh-bone appear not to be at all known in this country.

Just at the moment, when I was about to correct the sheet which treats of these accidents, the last number of the Edinburgh Medical and Surgical Journal was put into my hands, containing Mr. Liston's case of a bony reunion of a fracture of the neck of the femur *within the capsular ligament*. I had therefore merely the opportunity of making a brief note of the occurrence, as a proof of the possibility of such a fracture being reunited by means of callus. But, upon further enquiry, I find, that the preparation, of which Mr. Liston speaks, was some time ago presented to the Medical and Chirurgical Society of London, and, after being carefully examined by several intelligent members, was pronounced by them not to be an unequivocal specimen of a fracture within the capsular ligament. I notice the circumstance here, because the point, to which it refers in surgery, is of some importance, and ought not to be thought settled, until evidence is brought forwards, with which every good judge is fully satis-

fied. The preparation spoken of, is now deposited in the public museum of the Royal College of Surgeons in London, and, therefore, if the members of the Medical and Chirurgical Society, to whom I have alluded, have been mistaken in their opinion, the error is not likely to be long concealed, as every surgeon in the metropolis has it in his power to examine the identical preparation, and form a judgment for himself.

In the same chapter on fractures, I have introduced some highly interesting and practical remarks on fractures of the fibula, with luxation of the tibia, as recently published by Professor Dupuytren, whose sentiments on the treatment of this frequent accident, which is generally acknowledged to be very difficult of management, do not coincide with those of our celebrated countryman Mr. Pott.

In the concluding chapter, I have been careful to make amends for some omissions on the subject of dislocations in the last edition of the Dictionary; as for instance, with regard to luxations of the thumb. A few disputed points, about particular dislocations of the humerus, femur, and patella, have also been impartially considered.

South Crescent, Bedford-Square,
April 20th, 1820.

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ERRATA.

- Page 32. last line but one, for *mode* read *modes*
67. line 23. after *in* read *the*
69. line 16. for *lies* read *lay*
74. line 6. for *symptom* read *symptoms*
134. line 23. for *B.* read *C.*
320. note, for *Lungenbeck* read *Langenbeck*, and for *Steinschaittes*, read
Steinschnittes
354. line 27. for *six-and-twenty* read *thirteen*.

THE
FIRST LINES
OF THE
PRACTICE OF SURGERY.

PARTICULAR SURGICAL SUBJECTS CONTINUED.

CHAPTER I.

OF THE EXOMPHALOS, OR UMBILICAL HERNIA.

CUSTOM appears to sanction the extension of the terms, exomphalos, omphalocele, and umbilical hernia, not only to protrusions of the bowels through the opening of the navel, but to all other tumours of a similar nature, which present themselves any where in the vicinity of that aperture, and the majority of which actually take place in the linea alba, either above or below the precise situation of the umbilicus. The first form of the disease, or that which consists of a protrusion of the bowels through the umbilical ring, is chiefly seen in the foetus, or very young child * ; for, soon after birth, the navel, instead of being, as it previously was, the weakest point in the whole course of the linea alba, becomes the strongest, and the

* "Prior species infantibus, altera adultis maximè familiaris est." Cal-lisen, *Systema Chirurgiæ Hodiernæ*, t. 2. p. 497. 8vo. Hafniæ, 1800. Also Richter, *Anfangsgr. der Wundarzn.* b. 5. p. 452. Göttingen, 1801. Scarpa, *Traité des Hernies*, p. 315.; *Œuvres Chirurgicales de Desault* par Bichat, &c. &c. "As far as I have observed in infants, the protrusion generally takes place through the very centre of the navel." Monro on the *Morbid Anatomy of the Human Gullet, Stomach, and Intestines*, p. 504. 8vo. Edinb. 1811.

least capable of dilatation. In order to have clear ideas upon this subject, however, it is necessary to advert to a few anatomical circumstances, relating to the differences of the umbilicus and linea alba, in the foetal, infant, and adult states of the body.

DESCRIPTION OF THE LINEA ALBA AND UMBILICAL RING IN THE FŒTUS.

According to the very careful investigations of Professor Scarpa, the abdominal muscles, and especially the recti, in a foetus two months old, look like a yellowish mucus; and it is not before the fourth month that they exhibit traces of a fibrous structure, at their lower half, or between the navel and pubes; for, higher up, they are still entirely of a mucous consistence, and can scarcely be distinguished from the surrounding parts. Here they are likewise separated from each other by the magnitude of the liver, which, at this period, fills all the upper part of the abdomen, and particularly the umbilical region. In this situation, the anterior parietes of the belly are so thin that they seem as if they consisted merely of the layer of the peritoneum, originating at the root of the umbilical cord. In proportion as the abdominal muscles are developed, and their aponeuroses acquire a greater consistence, the whole linea alba closes, and the bag, which the peritoneum forms in front of the navel, gradually diminishes, and subsides towards the interior of the belly, continuing, however, to be plainly discernible as late as the seventh month. If, in a dead foetus of this age, pressure be made with the finger all along the linea alba, on the inside of the abdomen, the umbilicus is found to be the point that makes the least resistance; and a very slight force, directed from behind forwards, has the effect of making the peritoneum protrude at the umbilical ring. Thus, on the internal surface of the abdomen, a small depression, or pouch, is occasioned, which becomes larger and deeper when the cord is at the same time gently pulled outwards, being of a conical shape, with its base towards the interior of the abdomen, and its apex in the umbilical cord. This conical depression of the peritoneum is compared by Scarpa to a small hernial sac. When the peritoneum is separated from the circumference of the umbilical ring, the subjacent cellular membrane, and even that which connects the vessels of the cord and the urachus together, are found extremely soft and elastic, so that when the cord is gently drawn out, the vessels of which it is composed are readily elongated, or rather are pulled from within out of the abdomen. The edges of the umbilical ring

itself are thinner, and more supple, than all the rest of the *linea alba*. This disposition and looseness of the cellular substance of the cord, as Scarpa observes, are well calculated for preventing the umbilical vessels from suffering compression in their passage through the parietes of the abdomen, a state of things indispensable to the nutrition and growth of the *fœtus*, and, for the accomplishment of which important purposes, every thing is arranged by nature with admirable foresight.

STATE OF THE UMBILICUS A FEW MONTHS AFTER BIRTH.

If the umbilical ring be examined about two months after the cicatrization of the small ulcer occasioned by the detachment of the cord, the state of this opening is found to be exactly the reverse of that which is above represented. On passing the end of the finger along the *linea alba* within the belly, the little depression in the situation of the ring is now no longer perceptible; but, instead of it, a small hard tubercle is felt, which, as well as all the other parts composing the fasciculus of umbilical vessels, is intimately adherent to the peritoneum. The extremities of these vessels, converted into so many ligaments, are connected together, and attached to the circumference of the umbilical ring by a dense, compact, cellular substance, which appears mixed with aponeurotic fibres. Thus the small tubercle, arising from the union of the peritoneum to the remains of the umbilical vessels, cannot quit the ring without considerable difficulty, and this whether it be drawn inwards or outwards. In front, it is blended with the external cicatrix, which is somewhat thicker and harder than the surrounding skin, and, becoming more deeply situated as the subject grows older, at last contracts a close adhesion to the umbilical ring. According to Scarpa, this change is owing partly to the further retraction of the umbilical ligaments, and cicatrix itself, and partly to the accumulation of adipose substance in the circumference.

STATE OF THE UMBILICAL LIGAMENTS AND URACHUS IN THE CICATRIX OF THE NAVEL.

It is well explained by the same intelligent writer, that the umbilical ring, two months after birth, (and still more completely in the adult,) is not only shut up internally by the peritoneum, and externally by the integuments, like the rest of the tendinous openings of the abdomen; but it is also closed in its centre by the three umbilical ligaments, and the urachus. These ligaments form a triangle, the apex of which is inserted into the

EXOMPHALOS.

cicatrix of the integuments, while its base corresponds to the liver, the two ileo-lumbar regions, and the fundus of the bladder. Their union produces a kind of firm elastic frænum, which is of itself capable of making great resistance to a protrusion of the viscera through the umbilical ring: the crural arch and inguinal ring presenting nothing at all analogous. Besides this, the edges of the opening of the navel, which are thin and soft in a foetus of seven months, acquire considerable thickness and elasticity two months after birth. The opening itself gradually becomes proportionally narrower, and at length adheres very closely to the ligaments formed by the obliterated ends of the umbilical vessels.

It is manifest, then, that the foetus, as it approaches the period of birth, and the infant, as it grows older, are less and less subject to umbilical hernia. Yet this natural order of things may be disturbed by various causes, some of which, as will be hereafter explained, affect the foetus in utero, while others do not begin to operate till some time after birth.

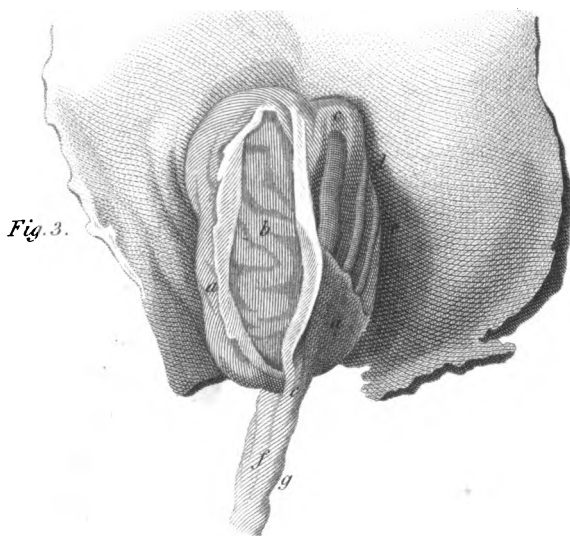
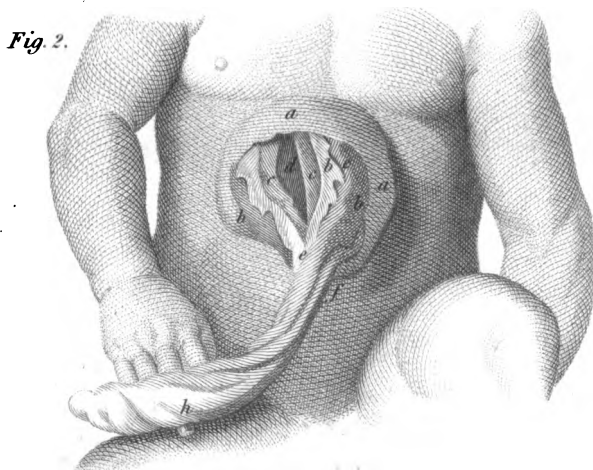
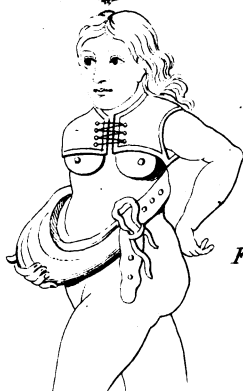
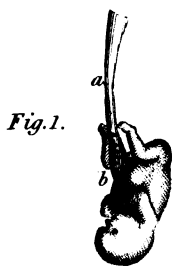
The changes which the umbilical ring undergoes, from the first months of gestation until the time of parturition, are completely the reverse of those which happen to the abdominal ring of a male foetus; for, as we learn from the preceding account of the subject, the former opening, during these early periods of existence, gradually contracts and closes up more and more; while, on the contrary, the inguinal ring is progressively developed and enlarged, in order to afford a passage for the testicle, the spermatic vessels, and cremaster muscle.

DIFFERENT SPECIES OF EXOMPHALOS.

Whoever wishes to acquire an accurate knowledge of the disease now engaging our attention, must view it in its three principal forms: first, as it presents itself in the foetus; secondly, as it is produced in an infant within a moderate period after birth; and lastly, with the peculiarities which it exhibits when it occurs in an adult subject.

1. *Congenital Exomphalos.*

This term is given to the case which sometimes affects the foetus in utero, and of course exists at the time of birth; the viscera protruding out of the umbilical ring itself, and passing into the cellular substance, which connects the vessels of the cord together. The present form of the disease may commence in any of the stages of gestation; for it is observed in the





embryo *, and in the foetus which has not yet acquired its full size, as well as in that which is completely grown. It commonly presents a peculiar appearance, being opaque at its base, where it is covered by the integuments of the belly, and transparent at every other point, where it is merely covered by the cellular membrane of the umbilical cord. The cord itself, indeed, appears as if it originated from, and extended itself out of, the apex of the tumour. The transparency of the external investment enables the surgeon to distinguish the hernial sac included in the triangular space, which is left between the separated umbilical vessels. The vein is always above, and the two arteries below, or on one side of the protruded viscera. The portion of the hernia lying between the separated umbilical vessels, is furnished with two coverings very distinct from each other, the external consisting of the cellular substance of the cord, and the internal being a production of the peritoneum, constituting a true hernial † sac. Between the two investments, a viscid substance is formed, resembling albumen. ‡

The hernial sac contains sometimes a piece of small intestine, sometimes a portion of the liver, and, in other instances, where the swelling is of very large size, the liver, spleen, and some of the great or small intestines. In the foetus from which fig. 1. plate x. of Scarpa's work was drawn, the hernial sac contained a portion of the great lobe of the liver, which extended in a conical shape between the umbilical vessels; but, in such cases, the whole of the liver is probably never displaced, a circumstance which seems to be rendered impossible by the

* See plate 10. fig. 1. taken from Scarpa, representing a congenital umbilical hernia in an embryo. a. The funis. b. The hernia.

† See plate 10. fig. 2. taken from Scarpa. a. a. The integuments around the navel covering the tumour. b. b. b. External covering of the hernia, consisting of the cellular substance, which connects the umbilical vessels together the whole length of the cord. c. c. The hernial sac formed by the peritoneum. d. A portion of the liver, of a cylindrical shape, protruding at the umbilical ring, and contained in the hernial sac. e. e. The umbilical vein, covered by the same kind of cellular texture which invests the funis. f. The umbilical artery of the left side, larger and more developed than common, the right one being entirely wanting in this subject. h. The umbilical cord.

Also plate 10. fig. 3. taken from Scarpa, representing a congenital umbilical hernia of considerable size. a. a. External investment, formed by the cellular membrane of the cord. b. The hernial sac, composed of peritoneum, the transparency of which allows the convolutions of the included bowels to be seen. c. c. Umbilical vein. d. e. The two umbilical arteries. f. The funis.

‡ Scarpa, *Traité Pratique des Hernies*, p. 323.

adhesions existing between this viscus and the diaphragm. Here we are to consider the hernia as formed only by a protrusion of that part of the liver which corresponds to the posterior surface of the umbilicus; nor can we wonder at the occurrence, when we recollect, that, in the early periods of life, the liver fills of itself the greatest part of the cavity of the abdomen, and naturally reaches to the navel. *

According to all appearances, the principal cause of the congenital exomphalos is a slow and imperfect developement of the abdominal muscles, combined with a considerable size of the viscera of the belly, and more especially of the liver. As the umbilical ring in the fœtus is the weakest point of all the parietes of the abdomen, the viscera under such circumstances must be very liable to protrude at this opening, and gradually make their way into the cellular substance, which connects the vessels of the cord together. Scarpa also conceives that a tense state of the funis, produced by its being twisted round the neck, or some other part of the body of the fœtus, may perhaps have a share in predisposing to the disease; for, in this state, a portion of the peritoneum is drawn out of the umbilical ring in the form of a small pouch, into which the bowels must be very disposed to fall. Lastly, a protracted and difficult labour may contribute, if not to the production of the disease, at least very seriously to its increase, after it has once commenced. In fact, as Scarpa remarks, it is in children born after difficult labours that we meet with those enormous exomphali which contain the liver, spleen, stomach, and part of the small intestines.

Children born with umbilical herniæ generally live but a short time, either because they are simultaneously afflicted with other malformations of a still more dangerous nature, such as spina bifida, an incomplete formation of the cranium, weakness of the abdominal muscles, considerable enlargement of the viscera, particularly the liver; or because the parts forming the hernial protrusion are in the majority of cases irreducible, by reason of their intimate adhesion to the neck of the hernial sac. † Experience proves, however, that there are

* Scarpa, *Traité Pratique des Hernies*, p. 323.

† Scarpa, *op. cit.* p. 324. Ruysch never saw a case that was saved; which might perhaps be owing either to his meeting with the disease only in an aggravated form, or to the circumstance of his adopting only the palliative method of covering the swelling with a soft plaster; a means which, without a previous effectual reduction of the viscera, must have left the infant to certain death. He remarks: "*Hunc affectum sæpius a me visum at nunquam curatum memini. Omnes enim ab utero ad tumulum delati fuere. 5to. 6to. 7mo. 8vo. aut 9vo. die.*" *Obs. Anatom. Chirurg. obs.* 71.

Fig. 1.

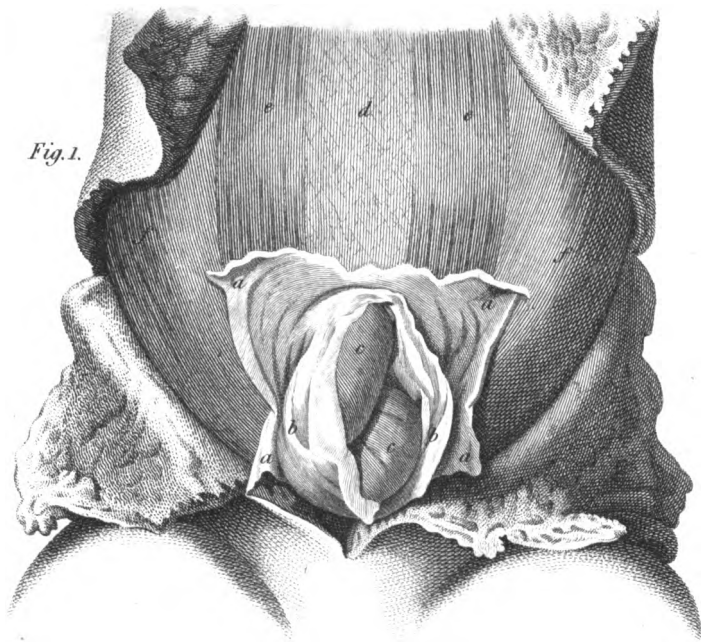
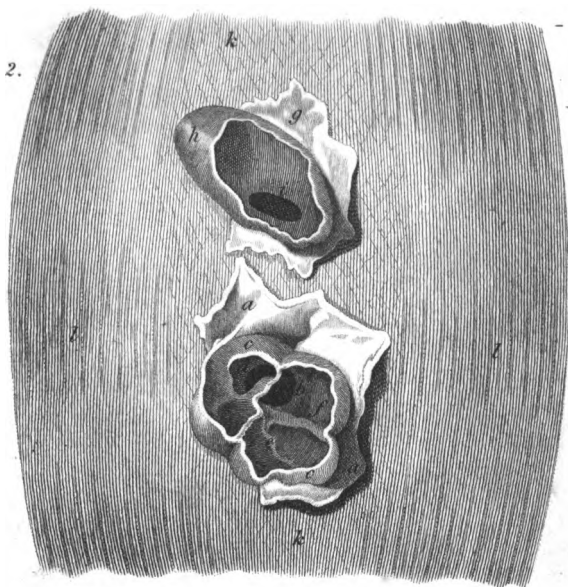


Fig. 2.



other cases, which are of smaller size, capable of reduction, and of a less complicated description, sometimes admitting of cure. At all events, every reducible case, whether large or small, whether complicated with other malformations and infirmities or not, should be carefully reduced, and means taken for hindering the protrusion of the parts again; for, when this indication is fulfilled, and the child continues to live, a radical cure naturally follows. For this purpose, after the reduction of the bowels, a conical graduated compress, covered by a circular quilted pad, is applied to the umbilical ring, and kept in its place with a roller. This practice, which is now recommended by all the best modern surgeons, including Pott, Callesen *, Scarpa, Hey †, Lawrence ‡, &c. is far safer, and more advisable, than another method, which consists in attempting the cure with a tight ligature put round the root of the swelling, as practised by Dr. Hamilton. § The compress, pad, and bandage must be occasionally taken off and re-applied, and if care be taken that they act effectually, the umbilical ring will frequently be sufficiently closed in the course of two or three weeks, to prevent any future protrusion. Prudence requires, however, that the apparatus should be worn somewhat longer.

Of the Exomphalos in young Subjects.

The true umbilical hernia, which is formed subsequently to birth, presents itself in children after the separation of the funis, and is generally attended with the following particularities:—The swelling is either of a round, cylindrical, or conical shape, with a circular base. No vestige of the cicatrix of the navel can be discerned upon it, except that near the apex, or upon one side of the tumor, a small portion of the skin seems paler and thinner than the rest. Underneath the common integuments another covering is found, consisting of a cellular substance, and of that delicate fascia which is spread over the surface of the abdominal muscles. When this second investment is opened, the true hernial sac is seen, which is thin, semitransparent, and in every respect similar to the rest of the peritoneum, as in other herniæ. || It usually contains a noose

* Syst. Chirurgiæ Hodiernæ, vol. ii. p. 499.

† Practical Observations in Surgery, p. 232. ed. 3.

‡ Treatise on Ruptures, p. 436. edit. 3.

§ See his letter to Mr. A. Cooper, published in the work of the latter on Crural and Umbilical Hernia, p. 56.

|| See plate 11. fig. 1., taken from Scarpa. a. a. a. a. Layer of cellular substance, which, together with the delicate tendinous expansion over

of intestine, and never, or but very rarely, omentum; a circumstance which Scarpa accounts for by the natural shortness of this membrane in young children. *

The occurrence of exomphalos in children, implies a combination of several unfavourable circumstances; 1. an imperfect closure of the umbilical ring; 2. immoderate compression of the abdomen in parturition, occasioned by its disproportionate size to that of the os tincæ; 3. the non-adhesion of the extremities of the umbilical vessels to the cicatrix of the integuments and edges of the umbilical ring; 4. weakness and looseness of the skin forming the cicatrix of the navel; 5. the continuance of the swelling of the belly after birth. If, says Scarpa, when these predisposing causes exist, suitable pressure be not made upon the navel after the separation of the funis, the child's incessant crying, its straining excited by attacks of colic, and the injudicious custom of applying tight swaddling clothes, sufficiently explain how it happens that the viscera protrude at the umbilical ring, which is at this period the weakest point of the whole circumference of the abdomen. The bowels, in passing through this aperture, separate the cicatrix of the integuments from the obliterated extremities of the umbilical vessels, and afterwards gradually distend the same cicatrix in such a manner that its wrinkles are effaced, and it can no longer be distinguished from the rest of the integuments of the hernia. † When children become dropsical, the navel is frequently protruded to a considerable extent, and on account of the transparency of the covering of the tumour, its contents are plainly discernible. ‡

The quickness with which the navel is closed after birth, and especially the retraction of the cicatrix by the umbilical ligaments, as the growth of the body proceeds, greatly promote the efficacy of bandages, and, in young children, facilitate the radical cure of this species of hernia. A disposition to such protrusions is very common during the first three or four months after birth, but moderate compression suffices for the removal of the swelling, and for keeping the parts reduced. In certain neglected cases, where nothing at all is done, and

the abdominal muscles, formed the second covering of the hernia, immediately under the skin. b. b. The hernial sac formed by the peritoneum. c. c. The small intestine included in the hernial sac. d. The linea alba. e. e. The rectus muscle. f. f. External oblique muscles.

* *Traité Pratique des Hernies*, p. 328.

† Scarpa, p. 331.

‡ *Monro on the Morbid Anatomy of the Human Gullet, Stomach, and Intestines*, p. 505.

the disease is allowed to continue for three or four years, the regular employment of a bandage will even then prove successful, and be the means of accomplishing a permanent cure; nay, according to Desault, the disposition of the umbilical ring to contract in young subjects is so great, that the protruded viscera are sometimes forced back by it into their original situation, and a spontaneous cure is the result. The efficacy of pressure in producing this desirable change has been generally acknowledged by the most impartial and experienced surgeons, both of the last and present century. It is singular, however, that Desault, who knew what little assistance nature required, should entertain on this point a different opinion; and he wrote strongly in favour of the ancient practice of reducing the bowels, and then applying a ligature round the root of the swelling, including the integuments as well as the hernial sac. This plan, after numerous trials, is at length going again into disrepute; for, it is found not only to be more severe than compression, but more liable to be followed by a relapse; and there is great reason for believing, that the degree of success which has attended it, is chiefly owing to the pressure employed for the purpose of supporting the cicatrix. In fact, the true indication is to hinder the protrusion of the bowels, so as to afford an opportunity for the umbilical ring to close; an object which, without the aid of pressure, would be entirely neglected in the use of the ligature.

Of the Exomphalos of the Adult Subject, and Herniæ of the Linea Alba.

As I have already explained, Professor Scarpa considers true exomphali, or those protrusions which occur through the umbilical ring itself, as peculiar to young subjects *, in which sentiment he differs from Mr. A. Cooper †, who represents the hernia as mostly happening through the navel itself. ‡ Monro appears also to join in the latter opinion; for, soon after observing that, in infants, the protrusion generally happens through the centre of the navel, he remarks, that pregnant women are disposed to the disease, in consequence of the enlargement and weakness of the umbilical ring. Before the time of J. L. Petit, all umbilical herniæ were supposed to protrude through the opening of the navel; but this eminent

* Op. cit. p. 315.

† On Crural and Umbilical Hernia, p. 35.

‡ Morbid Anatomy of the Human Gullet, Stomach, and Intestines, p. 505.

practitioner was perfectly aware of the mistake, which he was in the habit of commenting upon in his public lectures. "My observations (says he) are only meant to apply to adults; for in children afflicted with exomphali, the parts always pass out of the umbilical ring, and cannot well protrude in any other manner. However, I would not wish to be understood to assert, that, in adults, the parts never issue out of the umbilicus; but as I have seen this sort of case only twice in my life, this small number, compared with the great opportunities which I have had of seeing umbilical herniæ, authorises me to state, that out of one hundred of these ruptures not two happen through the opening of the navel, but the protrusions take place above, below, or on one side of that part." * Scarpa assures us, that a protrusion exactly at the umbilicus is very rare after childhood, and that if such a disease be sometimes noticed in adults or even in old persons, the probability is, that it has existed in these subjects from their earliest infancy, though no attention may have been paid to the tumour while it was of small size and free from inconvenience. † The same remark, says he, may be applied to the hydromphalos, caused by ascites, as well as to the small swelling which is sometimes produced at the umbilicus, by the bladder being enormously distended with urine; and he expresses his full conviction, that the hernia, which occurs in the umbilical region of the adult subject, and especially in females during the latter stages of pregnancy, does not protrude exactly through the navel, but only in the vicinity of it, that is to say, on one side or the other of this aperture, or else above or below it. Occasionally, even two herniæ take place near the umbilicus in the same woman, neither of which actually protrudes through that ‡ opening. Scarpa further remarks, that, in women who have had many children, the linea alba is generally very broad, thin, and imperfect §; but that, even in these individuals, the umbilical ring is rarely found dilated, which proves that in subjects, who are well formed from their infancy, the umbilicus is the firmest

* Petit, *Traité des Maladies Chirurgicales*, t. ii. p. 250.

† "Je suis même persuadé que s'il se fait des hernies par l'anneau même de l'ombilic, dans des adultes, ce ne peut être qu'à des personnes en qui cet anneau se trouve naturellement dilaté par un vice de la première conformation, ou bien en qui il resteroit encore quelques vestiges des hernies ombilicales qu'elles auroient eues dans leur enfance: encore faut il que ces personnes se trouvent exemptes de tout ce que nous avons dit pouvoir causer des écartemens dans les muscles du ventre, ou dans leurs aponévroses." Petit, *Traité des Maladies Chir.* t. ii. p. 254, 255.

‡ Monteggia, *Institutz. Chirurg.* p. 3. sez. 2. § 659.

§ Also, Laseus, *Pathologie Chir.* t. ii. p. 65.

point of the whole linea alba. * Influenced by such considerations, which appear indeed to have been originally suggested by Petit, Scarpa classes the common exomphalos of adult subjects with other herniæ of the linea alba, and is very particular in discriminating it from the true exomphalos, which is either congenital or produced during the state of infancy. In adults, the protrusion happens more frequently above than below the umbilicus; a fact which Scarpa explains by considering that the upper half of the linea alba, extending from the ensiform cartilage to the navel, is naturally broader and weaker than the lower half, while the recti muscles also become situated nearer together as they descend from the navel to the pubes. †

Scarpa lays down, with great accuracy, the distinguishing characters both of the true umbilical hernia, and of other cases which occur in the linea alba near the navel. The first disease, says he, whether met with in the infant or the adult, has a circular neck, or pedicle, at the circumference of which the tendinous margin of the umbilical ring can be felt with the end of the finger. Whatever may be the size of the tumour, its body always retains nearly a spherical shape; nor can any wrinkle of the skin, nor any thing at all resembling the cicatrix of the navel, be observed either upon the convexity or upon the sides of the swelling, the skin being merely a little paler and thinner at some points than others: on the contrary, in a hernia of the linea alba, the neck of the swelling is of an oval shape, like the fissure through which the protrusion has taken place. The tumour itself is also constantly of an oval form. When the finger is pressed deeply round its neck, the edges of the aperture in the linea alba are perceptible; and if the hernia be very near the navel, the umbilical cicatrix may be seen on one of the sides of the swelling, a sure indication that the viscera do not protrude through the umbilicus ‡ itself.

* Speaking of the firmness of the umbilicus in adults, Petit remarks, "Cette résistance est prouvée par ce qui s'observe dans les femmes qui ont eu beaucoup d'enfans; on y trouve l'anneau de l'ombilic dans son état naturel, tandis que la circonférence, qui est aponéurotique, est émincée et éraillée; ayant en plusieurs endroits ses fibres tendineuses, sinon toutes écartées, du moins toutes disposées à l'être." This valuable author then modifies the preceding statement by observing, that he does not deny that the umbilical ring may sometimes yield in corpulent women who have had many children, but that it is a rare occurrence, and when it happens is attended with a proportionate thinness and wasting of the margin of that opening. *Traité des Maladies Chir. t. ii. p. 351.*

† Scarpa, *op. cit.* p. 333.

‡ Scarpa, p. 336. See plate 11. fig. 2., taken from Scarpa, representing two herniæ in an adult; a true exomphalos, and a hernia of the linea alba

J. L. Petit was also extremely correct in his account of the characters by which a dilatation of the umbilical ring might be distinguished from that produced by a separation of the tendinous fibres in its vicinity from one another. These characters or signs are derived from the consistence of the edges of the opening, its shape, and its situation.

With regard to the consistence of the margins of the aperture, those of the umbilicus are firmer and more unyielding than the edges of a preternatural fissure; and as for the shape of the opening, that of the navel is exactly round, while that of protrusions between the tendinous fibres is oval, and never so regular. But the situation of the aperture is what affords the best criterion; for when the hernia takes place through the umbilical ring, the opening is in the middle of the abdomen, but in other cases it is either above, below, or on one side of that central point. Besides, unless a true exomphalos be of very large size, so as to cover and hide the umbilical ring, this opening can be plainly felt under the skin, separately from the hernia; for it constantly presents itself at the centre of the abdomen, like an indurated point, or at all events with a harder feel than the rest of the *linea alba*. *

In a true umbilical hernia, as Mr. Lawrence has observed, the shape of the tumour varies according as the patient is fat or thin: in the latter case, it is free and pendulous; in the former, larger at its basis, less prominent, and nearly hemispherical. The protruded parts will naturally tend downwards, so that the opening into the abdomen is from the upper part, and not from the middle of the swelling; and as the rupture grows larger, this observation becomes more and more applicable. †

Sometimes a tumour grows from the navel, and puts on a resemblance to an umbilical hernia. Dr. A. Monro, junior, met with an instance of this kind, where the swelling, which was of a strawberry colour, and situated in the navel, was removed by the application of sulphate of copper.

a little above the umbilicus. a. a. Layer of cellular substance, forming the second covering of the hernia, directly under the skin. b. The umbilical ring of a round shape. c. c. Hernial sac, composed of the peritoneum. d. e. f. The hernial sac divided into different pouches, an effect sometimes produced by the umbilical ligaments not yielding in the same proportion as the hernial sac. g. A hernia of the *linea alba*, with the layer of cellular membrane, which exactly covered the sac. h. The hernial sac formed by the peritoneum. i. The oval opening in the *linea alba*, through which the protrusion occurred. k. k. The *linea alba*. l. l. The recti.

* Petit, *Traité des Maladies Chir.* t. ii. p. 252.

† Lawrence on Ruptures, p. 421. edit. 3.

A large collection of hydatids within the liver, or upon its surface, sometimes give rise to a tumour at the side of the navel, which is liable to be mistaken for an exomphalos. *

Many surgeons of considerable eminence have fallen into the error of supposing, that true cases of exomphalos, particularly in adults, seldom have a hernial sac†, though it is admitted by several of the same writers, that such protrusions as happen in the linea alba are constantly furnished with a peritoneal investment. How Professor Richter could have retained this sentiment, with all the information which he possessed, is indeed surprising; for he not only tells us that there are many exceptions to the statement, but actually quotes instances from Schmucker‡ and Sandifort§, in which a hernial sac was found in the exomphali of adult subjects. Nay, says he, mistakes upon this point may easily be made, as the integuments at the navel are so closely adherent to the peritoneum that the latter membrane often cannot be distinguished from them, and therefore may be wrongly imagined to be altogether wanting. As an accurate writer observes, it does indeed frequently happen, in consequence of the peritoneum being closely connected to the inflected cicatrix of the integuments of the navel, that the distinction between the skin and hernial sac cannot be traced on the front of the tumour; but it is even then most easily discerned at every other part of the circumference. The umbilical hernia is not only furnished with a true peritoneal sac, but it possesses likewise a more superficial investment, derived from a condensation of the surrounding cellular substance. The coverings of this hernia, however, are frequently very thin. In old large cases, portions of the sac are sometimes absorbed, the viscera adherent to the integuments, and the intestine even strangulated in the aperture thus produced in the sac. || Cases exemplifying these facts are now so abundant in the records of surgery, that it is almost superfluous to cite them. ¶ Mr. A. Cooper mentions instances of this kind which fell under his own observation; and the occasional absorption of the sac in large

* Monro on the Morbid Anatomy of the Human Gullet, Stomach, and Intestines, p. 508.

† Garengeot, Mém. de l'Acad. de Chirurgie, t. iii. p. 341. Dionis, Cours des Opérations, p. 106. J. L. Petit, Traité des Maladies Chir. t. ii. p. 265. Richter, Anfangsgr. der Wundarzneykunst, b. v. p. 454. Callisen, Systema Chirurgiæ Hodiernæ, vol. ii. p. 497.

‡ Wahrnehmungen, 2 ter. Theil, p. 221.

§ Obs. Pathol. lib. i. 2.

|| Lawrence, Treatise on Ruptures, p. 424. edit. 3.

¶ On Crural and Umbilical Hernia, p. 36.

old exomphali, the passage of the intestines through preternatural holes, formed in the omentum, the very thin state of the integuments, and the situation of the bowels immediately under them, have been well explained by a judicious foreign professor *, who carefully describes the appearances in the dissection of a woman, who died from mortification of a large umbilical hernia. The knowledge of all these circumstances strongly indicates the prudence and necessity of using the utmost caution in opening an umbilical hernia, as the bowels may otherwise be wounded by the first stroke of the knife.

An umbilical rupture in an adult rarely contains intestine unaccompanied by omentum. Such a case, however, was operated upon by my friend Mr. Lawrence. † The transverse arch of the colon is the bowel mostly protruded, but the small intestines are also frequently found in the sac, and in some unusual instances the cœcum.

The exomphalos of the adult subject happens with much greater frequency in women ‡ than men, a fact which is explicable by the consideration that pregnancy has more influence than any other cause in bringing on the complaint. The swelling, indeed, generally becomes larger with every pregnancy; and, as the contents usually consist both of intestine and omentum, the disease mostly increases in size as the individual becomes fatter. Dropsical and corpulent individuals of both sexes are also frequently seen afflicted. The disease is by no means a common consequence of tapping in cases of dropsy; but facts of this kind are upon record, and Warner has related an example in which the water was let out by puncturing a protuberance caused by the fluid at the navel, and an umbilical hernia followed, which became strangulated, and required an operation. It may be as well to add, that, in this instance, the paracentesis had been done with a lancet, and that in the description of the operation on the hernia, no mention is made of a peritoneal hernial sac, which, in an exomphalos thus produced, might really be absent. § As Monro observes, it is obvious, from the disease preceding the labour-pains, and being connected with extreme corpulency, ascites,

* Lassus, *Pathologie Chirurgicale*, t. ii. p. 64. The skin could not be divided without opening some of the convolutions of the jejunum.

† Treatise on Hernia, p. 427. ed. 3.

‡ Of 71 cases observed in Holland, only 17 were men. (Soemmerring *Über die Ursache, &c. der Nabel-Brüche*. § 59.); and in 344 patients with umbilical hernia, recorded by the City of London Truss Society, there were 315 women. See Lawrence on Hernia, p. 426.

§ See Warner's Cases in Surgery, p. 229. edit. 4.

and dropsy of the ovarium, that it depends more upon weakness and extension than muscular exertion.*

Herniæ of the linea alba, when left to themselves, are much slower in their progress than true cases of exomphalos. On account of their small size they are frequently unobserved, especially in corpulent subjects, or when situated at the side of the ensiform cartilage. However, they bring on complaints of the stomach; habitual colics, particularly after meals; and, unfortunately for the patient, he may be troubled for a long while with such disorders before their true cause is detected. On the other hand, a true umbilical hernia may be known from the earliest period of its formation, both by the changes which it produces in the cicatrix of the navel, and by the rapidity of its increase.

These two species of hernia require similar modes of treatment; but the cases which happen in the linea alba, *cæteris paribus*, are more difficult of cure than the exomphalos, a circumstance which is probably owing to a natural tendency of the umbilical ring to contract, when the hernia is properly hindered from descending, an advantage which does not belong to openings accidentally formed in the linea alba.†

When the exomphalos is not kept reduced with a bandage or truss, but is allowed continually to protrude, its contents often acquire intimate adhesions to each other, and to the hernial sac, so as to form altogether one inseparable mass. Then the intestinal matter has sometimes a degree of difficulty in passing through that portion of the alimentary canal which is contained in the tumour. Frequently, indeed, it is detained there in sufficient quantity to cause obstruction, in which circumstance the contents of the intestines accumulate in that part of the canal which is betwixt the hernia and the stomach. In this sort of case, vomiting is one of the earliest symptoms, the obstruction being of that description which the French have called "*l'étranglement par engouement*." The matter brought up from the stomach often has a fecal smell and colour; and the vomiting, which sometimes takes place without much effort, may be for a long while almost the only complaint with which the patient is distressed.

In the mean while, the surgeon endeavours to reduce the hernia by the taxis; and occasionally the obstruction is removed with the aid of purgative clysters, small repeated doses

* *Morbid Anatomy of the Human Gullet, Stomach, and Intestines*, p. 506. 8vo. Edinb. 1811.

† Scarpa, p. 340.

of the sulphate of magnesia, and the application of ice or cold lotions to the tumour. In other examples, ten days or a fortnight may elapse without the symptoms being urgent enough to demand the operation. According to one very experienced surgeon, this urgency commences as soon as the swelling begins to be painful and inflamed, the taxis being then no longer advisable, and further delay likely to be followed by mortification of the protruded intestine.* Several of the best practical writers all concur in one important statement, which a prudent surgeon should constantly recollect, viz. that the exomphalos and herniæ of the linea alba are less subject to true strangulation than the generality of other ruptures; but, that when it unfortunately takes place, the symptoms are more intense, and the accession of gangrene more rapid, than in any other species of hernia. When in an exomphalos, or hernia of the linea alba, the omentum alone is strangulated, experience proves that the symptoms are almost as intense as when the bowel is also in the same state. In the former case, however, there is generally only nausea, and if vomiting supervene, it is less frequent and violent, than when the intestine is incarcerated; and the stools are hardly ever entirely suppressed. The reason why the effects of strangulation of the omentum in an exomphalos are more severe than in inguinal and crural herniæ, is referred by Scarpa to the proximity of the stomach.†

When practicable, the exomphalos should be reduced, and kept from descending again by means of a well-constructed truss. In young subjects, a radical cure sometimes follows the uninterrupted use of such an instrument. An excellent truss for an umbilical herniæ was a few years ago invented by Mr. Eagland, of Leeds, and has been described by Mr. Hey: it consists of two springs of cast steel, well tempered, and japanned to secure them from corrosion. Each spring is nearly of the shape of a horse-shoe, and being covered in the usual manner, is fastened by a distinct brass hinge placed vertically at the inner side of a small plate of thin steel, which, for cases of reducible exomphalos, is covered on the outer side with morocco leather, and on the inner side with one thickness of doe-leather, to which is firmly stitched a cushion of blanket and lining-leather, containing a piece of cork of a proper shape and size. When this part is applied; it adapts itself closely to the umbilical region, and by the regular and constant pressure of the springs, hinders a protrusion, without causing any un-

* Pelletan, *Clinique Chirurgicale*, t. iii. p. 89.

† *Traité Pratique des Hernies*, p. 361.

easiness. In irreducible cases, the piece of cork is omitted, and a plate of steel substituted, sufficiently large and concave to suit the projecting part.* In every reducible exomphalos, Scarpa rightly insists upon the propriety of using, both for infants and adults, a pad, which is somewhat conical, and calculated for keeping the bowels completely returned, and the integuments in contact with the umbilical ring, or fissure in the linea alba.† However, on account of the difficulty of applying a steel-truss to ruptures near the ensiform cartilage, the same distinguished author recommends in these cases the use of a pair of strong linen corsets, under which a compress is applied to the opening, through which the bowels protrude. In cases of exomphali, which are of enormous size and irreducible, the only plan, which can be well pursued, with a view of lessening the inconveniences of the disease, and retarding its increase, consists in applying a suspensory; and that employed by Fabricius Hildanus appears particularly well calculated for the purpose.‡

When, in adult subjects, an operation is unavoidable, on account of the continuance of strangulation, and its effects, the method of proceeding is not materially different from that which has been recommended in describing the treatment of a strangulated inguinal, or crural hernia. If possible, however, still greater caution is necessary, owing to the intimate connection between the integuments and hernial sac, and the adhesions often existing between the latter part and the omentum. The frequent situation of the intestine under the omentum should also be remembered. Scarpa considers a longitudinal incision preferable either to a crucial division of the integuments, or to one in the shape of the letter T. When the sac is opened, the omentum commonly presents itself, or rather constantly does so in adults, unless the bowel happen to protrude through a preternatural opening in that membrane, in which circumstance, the gut will of course lie immediately under the hernial sac. The introduction of a probe into the abdomen is often difficult, on account of the adhesions between the omentum and peritonéum forming the neck of the sac. After having got a probe, or director, into the opening, some surgeons remove the stricture by dividing the parts a little way directly upwards in the course of the linea alba. Scarpa,

* See Plate 12. Fig. 1. and Hey's Practical Observations in Surgery, p. 237. Edit. 3.

† *Traité Pratique des Hernies*, p. 354.

‡ See Plate 10. Fig. 4.

however, recommends carrying the incision directly downwards, if the case be a true exomphalos, and laterally, when the protrusion has occurred in the *linea alba*. * When an exomphalos is large and of long standing, the protruded viscera may have acquired so considerable a size, that their reduction becomes either impossible, or the attempt highly improper. Here, supposing no sign of gangrene to exist, the best plan is to be content with dividing the umbilical ring, and obviating the strangulation, without making any opening into the hernial sac. In the performance of this operation, Scarpa advises us to make a semicircular incision in the integuments on the outside of the neck of the hernia, and then cautiously to divide the subjacent aponeurotic investment. We are next to insinuate a grooved director between the neck of the hernial sac and the umbilical ring, and cut the hard tendinous margin of the latter opening as freely as circumstances may require. If a director cannot be easily got between the sac and ring, the nail of the left forefinger should be introduced between the neck of the sac and the border of the tendinous opening, which is to be dilated without any injury of the sac itself. This being accomplished, a gentle attempt is to be made to reduce the portion of bowel and omentum, nearest the ring. But, when adhesions hinder such reduction, the surgeon is to be content with removing the strangulation. Should it be found impracticable to make a suitable dilation of the stricture, without cutting the neck of the hernial sac, this must be opened with circumspection at the point where the umbilical ring has been already divided. † The preceding method appears much safer, than laying open an enormous swelling, and handling and exposing a large mass of viscera. I have seen one case, however, in which the bowel was strangulated by the pressure of a mass of diseased omentum; no dilation of the ring was practised; and, though the tumour was large, it was deemed necessary to open the hernial sac.

* Scarpa, p. 365.

† Ibid. p. 362.

CHAPTER II.

CONGENITAL INGUINAL HERNIA.

THIS case differs from all other ruptures in the circumstance of the protruded bowels being in immediate contact with the testicle, the tunica vaginalis serving as the hernial sac. Or, (to use the words of Richter,) the displaced bowel and the testicle, simply covered by its albuginea, lie together in one and the same sac: a peculiarity, which never occurs in a common bubonocoele, where each of those parts has its own distinct cavity, the protruded bowel being contained in a peritoneal hernial sac, and the testicle in the tunica vaginalis, both which cavities are, at the same time, quite separate, and without any kind of communication with each other. *

The old surgeons †, apprised by repeated experience of the occurrence of these herniæ, in which the protruded bowels and testicle lay together in the cavity of the tunica vaginalis, were much embarrassed how to offer a plausible explanation of the mode in which the viscera got into this singular situation; but the general idea was, that these cases had all been originally common bubonocoeles, and that the bowels afterwards passed into the cavity of the tunica vaginalis, in consequence of the ulceration, or bursting of the intervening parts. The French Surgeon, M. Méry, however, should be excepted from this statement; for, after making a very careful dissection of a congenital inguinal hernia, he came to a more correct conclusion, than many later anatomists and surgeons, including even Mr. Samuel Sharp ‡, the majority of whom, at the

* Richter, Anfangsgr. der Wundarzn. b. v. p. 403.

† It is somewhat remarkable, that the intelligent French surgeon, J. L. Petit should never have been convinced by experience of the possibility of the bowels getting into the same cavity with the testicle; and so much in the dark was he, that he absolutely ridicules the idea of such an occurrence. "Je ne dis rien de l'adhérence des parties de la hernie avec le testicule, et les vaisseaux spermatiques; c'est cependant une fameuse remarque de quantité d'auteurs, et il y a quarante ans que je la respectois fort; je craignois de trouver pareil cas; &c. La pratique m'a guéri de cette terreur panique, et j'ai connu que les auteurs de cette remarque ignoroient l'anatomie; et que peut-être cette remarque était faite au cabinet; car, sur le sujet même, cela n'est pas possible, puisque le testicule et les parties qui font la hernie, ne se trouvent jamais renfermées dans le même sac." *Traité des Maladies Chirurgicales*, t. ii. p. 386, 387.

‡ "It sometimes happens, that the intestine or omentum is found within the tunica vaginalis, or the testicle not contained in a sac, but lying imme-

period when the Critical Inquiry was written, subscribed to the above mistaken notion. * In the case examined and recorded by M. Méry, it is positively denied, that the adhesion of the omentum to the spermatic cord and testicle could be the result of any breach in the tunica vaginalis, which had every appearance of being sound and perfect. This extraordinary union, (says Méry,) can only be accounted for by supposing, that, in the patient in question there existed a natural sheath of peritonæum, resembling what is seen in the males of several kinds of animals. This sheath, which is naturally hollow, communicates with the cavity of the abdomen, extends from the ilia to the bottom of the scrotum, and includes the spermatic vessels, with the testicle, &c. Admitting these things (says M. Méry), it is easy to imagine, that the omentum, after falling into this sheath, might become adherent to the spermatic cord and testicle, during a protracted lodgment in the same cavity with that gland. †

diately in contact with the body of the testicle: this may perhaps appear surprising, not only because it necessarily implies a rupture of the peritonæum, but because the viscera must also be forced through the part which I have just described as the septum of the tunicæ vaginales." *Critical Enquiry into the present State of Surgery*, p. 7. Edit. 4. 1761.

* Some few offered a different, but an equally erroneous conjecture: "Alii contra voluerunt extenuationem et adhæSIONem utrius tunicæ, cum inter se, tum ad testicululum, tantum ad fuisse, ut hic extuberans inter saccum herniæ, in eo omnino esse videretur." *Eduardi Sandifort Icones Herniæ Inguinalis Congenitæ*, p. 8. Lugd. 1781. Also Morgagni de Sed. et Caus. Morborum, Epist. 431. Art. 8.

† "Cette adhérence de l'épiploon au cordon spermatique et au testicle n'est point l'effet de la rupture de la tunique vaginale qui s'est trouvée saine et entière. On ne peut rendre raison de cette union extraordinaire, qu'en supposant dans le malade dont il s'agit une gaine naturelle au péritoine, semblable à celle qui se rencontre dans les mâles de plusieurs espèces d'animaux. Cette gaine, naturellement creuse, communique dans la capacité du ventre, s'étend depuis les illes jusque dans le fond du scrotum, et renferme les vaisseaux spermatique, avec le testicule, qui sont attachés à sa surface intérieure par une membrane très-déliée, large d'environ deux lignes, et de la longueur de la gaine elle-même. Cela supposé, il est aisé de s'imaginer que l'épiploon descendu dans cette gaine a pu s'unir facilement au cordon spermatique et au testicule, par le long séjour qu'il a fait dans sa cavité, &c." Méry, in *Mémoires de l'Acad. des Sciences*, ann. 1701, p. 282. Obs. 3. The observation of the tunica vaginalis being a production of peritonæum, and of its upper part communicating with the cavity of the belly, in certain ruptures, was made centuries ago. "Quamvis enim Hippolytus Boscus, Ferrariensis, (ne de vetustioribus dicam) jam anno 1596, in puero hernioso, ostenderit vaginam testiculo fieri a peritonæo, eamque ita dilatatam in suo exortu ad finem et fundum usque viderit, ut duo digiti manus facile ingrederentur; et hoc ipso seculo chirurgus, non incelebris, Parisinus, (M. Le Reneaulme de la Garanne, *Essai d'un Traité des Hernies*, Paris, 1726.) dixerit, esse meatum quemdam in pueris, versus cavum abdominis apertum, vasa spermatica concomitantem, in adultioribus,

When it is considered, that these observations were published in 1701, they will be allowed to possess a good deal of merit; for, it was not until the year 1749, that the subject received further elucidation from the genius and industry of Haller. Méry, as we see, had discernment enough to find out, that the bowels did not descend into the tunica vaginalis by a destruction of the parts intervening between the testis and the contents of an ordinary bubonocoele; and he even suggested, that there must have been a process of peritonæum in the scrotum, communicating with the cavity of the abdomen, and ready for the reception of the viscera. Unfortunately, however, he pursued the investigation no further, so that it remained for Haller *, Hunter †, and Pott‡, to enrich pathological science by a more ample explanation of the true nature of the congenital inguinal hernia, and of the way in which its origin is connected with the situation and descent of the testis in the young subject

The origin of this species of hernia is as follows; until the approach of birth, the testes of the foetus are lodged within the cavity of the abdomen, and situated immediately below the kidneys, on the fore-part of the psoas muscles, by the side of the rectum, which bowel is larger in proportion to the capacity of the pelvis than in the full-grown subject, and lies before the lumbar vertebræ as well as the os sacrum. The anterior and lateral surfaces of the testis are covered by reflected peritonæum, while posteriorly it adheres to the psoas muscle by means of cellular substance. § A little while before birth, generally in the eighth month ||, but sometimes subsequently to this event, the testes descend through the ab-

quandoque, ex Duvernejji observatione, aqua distentum, quem facile partes, abdomine contentæ, intrare, sicque herniam formare possunt; non tamen ad id attenderunt anatomici," &c. Eduardi Sandifort Icones Herniæ Inguinalis Congenitæ, p. 7. Lugd. 1781.

* Programma Herniarum Observationes aliquot continens, Goetting. 1749.

† Medical Commentaries, Lond. 1762.

‡ Account of a particular kind of rupture, frequently attendant on newborn children, and sometimes met with in adults. Lond. 1757.

§ See Observations on Certain Parts of the Animal Economy, by John Hunter, p. 2, 3.

|| "It becomes difficult, (says Mr. Hunter,) to ascertain the precise time of this descent, as we have hardly ever known the exact age of our subject. According to the observations which I have made, it seems to happen sooner in some instances than others, but generally about the eighth month. In the seventh month, I have commonly found the testis in the abdomen; and, in the ninth, I have as commonly found it in the upper part of the scrotum." Op. cit. p. 9.

dominal ring, and then pass through a kind of membranous canal, which the peritonæum forms from that aperture into the scrotum. Thus, as they were already furnished with one peritoneal investment up in the loins, a second is acquired by their entering this canal, or rather elongation of the peritonæum. The first covering, which is smooth, and every where closely adherent to the surface of the testis, constitutes the tunica albuginea; while the other, which is denser, and in front loose and unconnected, becomes the tunica vaginalis. "While the testis is descending (says Mr. Hunter), and even when it has passed into the scrotum, it is still covered by the peritonæum, exactly in the same manner, as when within the abdomen; the spermatic vessels running down behind the peritonæum there, as they did when the testis lay before the psoas muscle. That lamella of the peritonæum is united behind with the testis, the epididymis, and the spermatic vessels, as it was in the loins, and likewise with the vas deferens; but, the testis is fixed posteriorly to the parts against which it rests, being unconnected and loose forwards, as while it remained in the abdomen. In coming down, the testis brings the peritonæum with it; and the elongation of that membrane, though in some circumstances it be like a common hernial sac, yet, in others, is very different. If we can imagine a common hernial sac reaching to the bottom of the scrotum, covered by the cremaster muscle; and that the posterior half of the sac covers, and is united with the testis, epididymis, spermatic vessels, and vas deferens; and that the anterior half of the sac lies loose before all those parts, it will give a perfect idea of the state of the peritonæum, and of the testis when it first comes down into the scrotum. The testis, therefore, in its descent, does not fall loose, like the intestine, or epiploon, into the elongation of the peritonæum; but, slides down from the loins, carrying the peritonæum with it; and both that (the testis) and the peritonæum continue to adhere, by the cellular membrane, to the parts behind them as they did when in the loins." * Soon after the testes have arrived in the scrotum, the upper part of the peritoneal canal is gradually shut up and obliterated, by which change, all communication between the cavity of the peritonæum and that of the tunica vaginalis is effectually annihilated. The exact period of time, when the peritoneal canal closes probably differs a little in different individuals, as the most correct writers are not entirely agreed

* Observations on Certain Parts of the Animal Economy, p. 10.

about it*; but, according to John Hunter and Wrisberg†, both testes have usually got to the bottom of the scrotum in the ninth month, and the passage is closed. Sometimes, however, the complete closure of the peritoneal canal, through which the testis descends, is certainly delayed for a greater or lesser space of time after the child is born, in which circumstance, if any of the bowels be forced into it, they become, of course, as long as they continue unreduced, an impediment to its further obliteration. The communication, between the cavity of the abdomen and that of the tunica vaginalis, then continues open, and the protruded bowel, and the testis, covered merely by its albuginea, lie together in one and the same sac, which is the tunica vaginalis itself. Such is the nature of the ordinary congenital inguinal hernia.‡

In a common rupture, the viscera push out with them a portion of the great bag of the peritonæum, which, thus forming one of the most regular investments of the displaced bowels, is called the *hernial sac*. But, in the congenital inguinal hernia, the sac, in which the viscera lie, is not thrust forth in this manner by the displaced bowels: on the contrary, it is a production of peritonæum originally formed, and placed ready for the reception of the testes on their descent from the loins, but, into which the bowels are sometimes accidentally propelled, before the passage leading into it from the belly is duly closed. The congenital inguinal hernia, therefore, differs from the generality of ruptures in having no hernial sac, formed and produced by the peritonæum being thrust forth from the belly by the displaced bowels themselves. There is indeed one very uncommon species of scrotal hernia, contained in the tunica vaginalis, yet included also in a common hernial sac, so that the protruded bowels neither lie in contact with the preceding membrane, nor with the albuginea. This particular case was first noticed and described by the late Mr. Hey: it seems to be formed, after the communication of the cavity of the peritonæum with that of the tunica vaginalis has

* Camper found the communication between the abdomen and tunica vaginalis open in 11 new-born infants out of 17, which he examined. *Comment. Societatis Reg. Scientiarum, Gotting. 1778.*

† See *Observations on Certain Parts of the Animal Economy*, p. 9. Edit. 2., also p. 12., where it is observed, "It is seldom that any aperture remains in a child born at its full time."

‡ "It should be observed, however, that the hernia congenita may happen, not only by the intestine falling down to the testis before the aperture of the sac is shut up, but perhaps afterwards: for, when the sac has been recently closed, it seems possible enough that violence may open it again." Hunter, in *Obs. on Certain Parts of the Animal Economy*, p. 15.

been obliterated, but previously to the closure of the passage lower down.*

It is curious, that the above-described peritoneal canal, forming in the foetus a communication between the abdomen and the scrotum, should sometimes remain open a considerable time after birth, without being attended with any hernial protrusion; a fact, fully authorising the inference, that we should look to other circumstances, besides the descent of the viscera, for an explanation of the cause by which the closure of this canal is deferred to so late a period. In consequence of the passage being thus left unobliterated, for a great length of time, however, a rupture of precisely the same nature as the congenital inguinal hernia may first happen long after birth; while the instances, in which this conformation exists, unaccompanied with any protrusion, amount to an unequivocal proof, that this species of rupture essentially requires for its production, not only a pervious state of the peritoneal canal, but also the operation of a cause capable of determining the bowels to fall down into the passage.

According to Richter, the testis in its descent towards the scrotum, through the peritoneal canal, no where meets with greater impediment than at the abdominal ring.† When, says he, it passes this narrow point of its course, without much delay, nature soon closes up the passage. But, should the contrary happen, that is, should the testis be detained a long while at the ring, the corresponding part of the peritoneal canal would be preternaturally dilated, and nature hindered from effecting its obliteration at the usual period. In a case of this description, when the testis at length descends completely into the scrotum, the mouth of the canal is left considerably widened, and in a state which certainly must facilitate a protrusion of the viscera.‡ Sometimes, the passage, through

* Hey's Practical Observations in Surgery, p. 221, &c. Another case of the same nature is described in Mr. A. Cooper's Work on Inguinal and Congenital Hernia, p. 59.

† This observation appears to have been originally made by John Hunter: "The place where the ligament is most confined, and where the testis meets with most obstruction in its descent, is the ring in the tendon of the external oblique muscle; and, accordingly, I think we see more men with one testis, or both, lodged immediately within the tendon of that muscle, than others who have one or both still included in the cavity of the abdomen." See Observations on Certain Parts of the Animal Economy, p. 9, also p. 16. Edit. 2.

‡ These sentiments coincide very much with those of Mr. Hunter: "I have said, that the early descent of the testicles, and closing of the mouth of the sac, by usually happening before birth, prevent likewise the descent of

which the testis descends, is found so dilated (or one might rather say, contracted) at various points, that it resembles a row of separate cysts; an appearance, which Richter attempts to solve the cause of by supposing, that each of these expansions is occasioned by the protracted lodgment of the testis at the dilated part. *

Arnaud had an idea, that each constricted portion of the body of a hernial sac originally corresponded to the ring; that it became gradually removed from it as the hernia increased in size; and that then a new contraction was formed in the situation now answering to that opening. Thus an endeavour was made to account for the successive formation of various contractions on the same hernial sac. But, in congenital ruptures, this explanation is inconsistent with the fact of the sac being all of it originally placed in the groin and scrotum, previously to the descent of the bowels, and not a protrusion of the peritonæum by the displaced viscera. Hence, Professor Scarpa most properly regards Arnaud's opinion upon this point as a mere unsupported conjecture; and the same may be said of Richter's idea. Though the frequent occurrence of such contractions in the sacs of congenital herniæ in particular, has excited a great deal of attention, I am not aware that any explanations hitherto offered with regard to their cause, are entitled to our confidence. "If it were true (says Scarpa) as some surgeons assure us, that the constrictions of the body of the hernial sac happened only in congenital inguinal hernia, a satisfactory explanation of their origin might be deduced from Camper's remarks on the natural form of the tunica vaginalis in the fœtus, at which early period, it swells up irregularly, when inflated, exhibiting in its course, several natural strangulations." † May not these constrictions (says Scarpa), under certain circumstances, remain in subjects affected with congenital herniæ, while other parts of the tunica vaginalis are distended by the viscera? Whatever degree of probability this explanation may have, it must undoubtedly be insufficient, if it be proved that similar constrictions may take place in the body of the sac of a common inguinal hernia. ‡

any part of the abdominal viscera; but, when the testicles remain in their first situation beyond this period, these advantages are lost; a part of the intestines, or epiploon, being, under these circumstances, liable to descend along with them." On Certain Parts of the Animal Economy, p. 15.

* Richter, Anfangsgr. der Wundarzn. b. v. p. 434.

† Camper, Icones Herniarum, Tab. x. Fig. 2, 3, & 4.

‡ Scarpa, Traité Pratique des Hernies, p. 121. At the upper part of the

It seems highly probable, that the delay of the testis at the ring, and the consequent dilatation of the corresponding portion of the peritoneal canal, ought to be regarded as one of the most common predisposing causes of congenital inguinal hernia: Sandifort * inclines to Richter's sentiment, which has a still higher support in the authority of John Hunter, to whom the suggestion perhaps strictly belongs; but the former makes an exception of those instances, in which the hernia appears to be the consequence of an adhesion between the bowels and the testis previously to its descent; an important circumstance, of which more notice will be presently taken. Nor can the sort of dilatation spoken of by Richter, have any share in the production of the disease, when the viscera protrude into the tunica vaginalis, while the testis remains within the abdomen, never having reached the upper part of the peritoneal canal at all. At the same time, it can easily be conceived, that, in this particular example, the very circumstance of the protracted descent of the testis may lessen the tendency of the upper portion of the tunica vaginalis to close at the usual period, and thus become a predisposing cause of the protrusion of the bowels.

Another fact, very necessary to be understood, is, that the common forms of this disease are seldom produced by the bowel insinuating itself into the passage simultaneously with the testis. Before birth, the small intestines are but little distended, and, in the absence of respiration, they can suffer no compression from the diaphragm and abdominal muscles. Under these circumstances, it is difficult to imagine, how they can be at all likely to protrude from the cavity of the belly; and, in fact, notwithstanding the use of the expression, "congenital," the disease is hardly ever observed in infants directly they are born, but makes its first appearance afterwards. The child only brings with it into the world a state of parts, which is favourable to the occurrence of the complaint; or, in plainer terms, it is born with a pervious and

sac, these contractions may be referred to the natural disposition of the peritoneal canal to close in that situation.

* "Nullatenus tamen negandum est, hærentem nimis diu in fissura obliqui externi et apertura canalis, testem, has partes sic dilatare, ut postea vix debito modo sese claudere possint, sed ostium productionis peritonæi aptissimum maneat quod intestina, vel minimo nisu eo versus depulsa, admittat." *Icones Herniæ Inguinalis Congenitæ*, p. 22.

† "The descent being thus early, and the passage being almost immediately closed, are the principal means of preventing the hernia congenita." *Obs. on Certain Parts of the Animal Economy*, p. 9.

preternaturally dilated communication between the cavity of the peritonæum and that of the tunica vaginalis. When, says Mr. Hunter, the testis has remained in the cavity of the abdomen beyond the usual time, it is impossible to say, whether the disposition for closing up the passage is in any degree lost, or not; but, when it comes down after birth, we can easily suppose a portion of intestine, or epiploon, is more likely to descend, and prevent the closure of the mouth of the sac, than before the child was born, when certain actions had not taken place.*

Some congenital herniæ have been known to take place for the first time as late as the age of twelve, fifteen, twenty, and even thirty. Probably, in several of these examples, the testicle had remained all this while within the abdominal ring †, and without descending into the scrotum ‡; and when it did descend, the bowels followed it; but I am unable to judge of the accuracy of the opinion given by Richter||, that, in many of these cases, the canal must have been burst open again by the impulse of the viscera.

One accidental circumstance, however, may make a rupture strictly congenital; or, I should rather say, it is now proved by the observation of a large number of cases, that there are two states, which are conducive to this less frequent event. Before birth, either a part of the intestine, or omentum, may adhere to the testis previously to its leaving the abdomen, so that when this gland descends into the scrotum, the connected bowel necessarily follows it: or the peritonæum, investing the spermatic vessels, may send off a short fold, resembling a ligament, to the adjacent part of the ileum, or cœcum, by means of which membranous fold the bowels, on the right side, where congenital herniæ are most frequently noticed, are

* Observations on Certain Parts of the Animal Œconomy, p. 16.

† The descent of the testis is very slow, when not completed before birth; the process indeed often occupies years, and even then the testis sometimes never reaches the lower part of the scrotum. According to Mr. Hunter, the completion of the descent, in retarded cases, most frequently happens between the ages of two and ten, while the person is young and growing, and is seldom delayed beyond the age of puberty. Op. cit. p. 16.

‡ In one patient, aged 20, both the testes, which till then had been concealed in the abdomen behind the rings, were suddenly expelled from these openings, in a violent exertion made to leap over a wide ditch: their issue was soon followed by a descent of the bowels. See Dict. des Sciences Médicales, t. xxi. p. 161. Mr. Hunter knew a rupture happen in a man thirty years old, where the testes had not even got into the ring. Obs. on Animal Œconomy, p. 17. edit. 2.

|| Anfangsgr. der Wundarzn. b v. p. 454.

drawn down from their natural situation in the groin, upon the passage of the testis into the scrotum.*

The formation of such adhesions between the bowels and testis before birth, may also sometimes prevent, or at least, seriously retard the descent of the latter organ. In an infant, which had only one testis in the scrotum, and died a few hours after birth, the opposite one was found close to the ring, and connected to the omentum by three slender filaments.† In the body of a very aged subject, the left testis, which was of its natural size, was found situated between the iliacus internus and psoas muscles, an inch from the superior opening of the peritoneal canal. The epididymis, which was well formed, adhered to the sigmoid flexure of the colon by means of a whitish, strong, round filament.‡ Sometimes, when the descent of the testis is impeded, it would seem, as if the gubernaculum, by its retraction towards the scrotum draws down the elongation of peritonæum, which is to constitute the tunica vaginalis, and at the same time drags the epididymis to a greater or lesser distance below the body of the testis.||

The congenital inguinal hernia cannot be divided, like bubonocœles, into *external* and *internal*; but must evidently always be *external*, since the neck of the tunica vaginalis invariably corresponds to the point, at which the spermatic cord passes under the border of the transversalis muscle. The tunica vaginalis has also the same anatomical relations as the sac of a common inguinal hernia; like it, passing completely through the inguinal canal, from one end of it to the other, lying on the front of the spermatic cord. Of course, it passes through the separation between the lower fibres of the obliquus internus and the principal origin of the cremaster muscle. On coming out of the ring, it still adheres closely to the spermatic cord, and is enclosed in the muscular and aponeurotic expansion of the cremaster, which accompanies it to the bottom of the scrotum. As the tunica vaginalis, containing the protruded viscera, enters the inguinal canal beyond the point, at which

* Wrisberg, *Observat. Anatom. de Testiculorum Descensu*, p. 48. Sandifort has also detailed a case, in which the appendicula vermiformis, which was adherent both to the testis and the sac, had drawn down the cæcum, and part of the colon, and ileum. *Icones Herniæ Inguinalis Congenitæ*, p. 12. Wrisberg saw two other strictly congenital ruptures on the right side, both seemingly induced in a similar manner. *Op. supra cit.* p. 24, 25.

† Wrisberg, *Comment. Societ. Scient. Goetting.* 1778. p. 43, &c.

‡ Jules Cloquet, *Récherches sur les Causes et l'Anatomie des Hernies Abdominales*, Obs. 6. t. 24. 4to. Paris, 1819.

|| Cloquet *loc. cit.* obs. 5. p. 23.

the spermatic cord crosses the epigastric artery, it is clear, that, by following precisely the direction of the cord, it must also cross the artery, and push it from the external to the internal side of the ring. The displacement of the epigastric artery, therefore, is a constant occurrence in the congenital inguinal hernia, just as it is in the common *external* bubonocoele. *

A congenital inguinal hernia is, at first, generally an enterocele, the omentum in young infants being too small and short to protrude under ordinary circumstances down into the scrotum. However, when the testis, previously to its descent, becomes accidentally adherent to the omentum, the disease may be from the first, and in the youngest subject, an epiplocele†; and, in other cases, where no such connexion exists, the omentum may afterwards descend into the hernial cavity. As Sandifort remarks‡, not only has intestine alone§ been found in this species of hernia, but, in a more advanced age, the omentum, either with ||, or without ¶, a portion of the bowels, has formed the contents of the tumour.

The most important symptom, by which a congenital inguinal hernia may be distinguished from a common scrotal rupture, is the situation of the testis, which, in the latter disease, can always be plainly felt towards the lower and back part of the tumor. But, in a congenital hernia, if the protrusion be at all considerable, the testis cannot be felt while the bowels are down. When we hear also, that the patient has had the complaint from his earliest childhood, we have strong reason for

* Scarpa, *Traité Pratique des Hernies*, p. 74. For the purpose of illustrating the subject of this chapter, some of Sandifort's *Icones* are introduced at the end of this volume. See plate 12. fig. 2. and plate 13. fig. 1 and 2. with the explanations.

† Thus Mr. A. Burns saw the omentum protruding into the sac of a congenital hernia of a new-born child, having previously adhered to the testis, and been dragged from the abdomen along with that organ. See Monro's *Morbid Anatomy of the Human Gullet, Stomach, and Intestines*, p. 511. 8vo. Edin. 1811.

‡ *Icones Herniæ Inguinalis Congenitæ*, p. 24.

§ Reichel met with a part of the ileum alone: Ludwig, *Adversar. Med. Pract.* vol. iii. p. 736. Wrisberg found a portion of the ileum and colon, with the cæcum and appendix vermiformis: *Obs. Anatom. de Testiculorum Descensu*, p. 56. And Sandifort saw the same parts in such a rupture. *Icones Herniæ Inguinalis Congenitæ*, p. 15.

|| Pott's *Chirurgical Works*, vol. ii. p. 189; Richter *Abhandlung von Brüchen*, 2 band. p. 137; and Lobstein de *Hernia Congenita*, who saw all the intestines protruded with a portion of the omentum, except the duodenum and rectum. De *Hernia Congenita*, p. 7.

¶ Meckel de *Morbo Hernioso Congenito*, p. 31—37; Pott's *Chirurgical Works*, vol. ii. p. 185, patient 14 years of age; Wrisberg, *lib. cit.* p. 49.

suspecting the case to be of the congenital kind. But, when such intelligence is communicated to us, we are not, without further consideration, to pronounce the disease positively to be congenital rupture; for, experience proves, that every hernia in a child is not invariably of this description. A bubonocoele has been seen in a child only fourteen months old, and, what is also worthy of notice, the case was strangulated, and required the operation.*

According to *Monro*, the tumour, formed by a congenital inguinal hernia, passes out perpendicularly from the abdomen; because, in a new born infant, the spermatic cord does not pass obliquely through the parietes of the abdomen, as in the adult, but directly through them.†

Scarpa adverts also to the following circumstances, the recollection of which will be of great service in distinguishing a congenital from a common inguinal hernia:—1. When this last case, whether external, or internal, passes into the scrotum, it cannot descend beyond the point, where the spermatic vessels enter the testicle. Here the cellular membrane of the spermatic cord terminates, and here the hernial sac must necessarily be stopped. On the contrary, in the congenital hernia, the viscera may descend lower than the testicle, with which they are in immediate contact, and may at length even occupy its place, pushing it upwards and backwards.—2. In a congenital hernia, the viscera usually pass from the groin down into the scrotum in a very short space of time, and, as it were, precipitately; but, in a common inguinal hernia, the protrusion is generally slower and more gradual. The reason of this difference is sufficiently manifest: in the former case the descent of the testicle, and the ready-formed tunica vaginalis, have opened and prepared the course, which the viscera are to follow as they protrude; while, in the latter, the hernial sac can only get into the scrotum by gradually elongating the layers of cellular substance, which connect it to the surrounding parts. This fact, says *Scarpa*, is so generally admitted, that experienced practitioners consider the quickness, with which the bowels have descended from the groin into the scrotum, as a characteristic mark of a congenital scrotal hernia.‡

Sometimes the testis is so enveloped in the omentum, that the disease may be, and indeed has been, mistaken for a sarcocele.§

* See *Lawrence on Ruptures*, p. 65. edit. 3.

† *Monro on the Morbid Anatomy of the Human Gullet, Stomach, and Intestines*, p. 510.

‡ *Scarpa Traité Pratique des Hernies*, p. 75, 76.

§ *Méry in Mem. de l'Acad. Royale des Sciences de Paris*, Ar. 1701. p. 279.

The viscera, included in a congenital hernia, but more especially the omentum, are frequently adherent to the testis; a complication attended with serious inconvenience*; for, whenever an endeavour is made to reduce the hernia, the testis is forcibly drawn up to, or even within the abdominal ring; the patient is subjected to a good deal of pain, the hernia cannot be effectually returned, and the use of a truss is inadmissible. It was a very slender connexion of this sort which made the rupture of the celebrated Zimmerman irreducible, and caused him such annoyance, as induced him to submit to a fatal operation. The omentum, often thickened, and changed into a firm cylindrical mass†, may also adhere either to the sac, or the epididymis, or both‡, and a similar connexion is often remarked between the testis, the sac, and the intestine§. Sometimes the testis remains at, or within the abdominal ring, while a piece of intestine lies in the scrotum.¶ This is another case in which a truss cannot be rightly employed. When the testis lies in the groin, it may also be so covered and concealed by the protruded bowel, or omentum, as not to admit of being plainly felt, in which circumstance, it is very liable to be injured either in the taxis, or an operation with the knife. The possibility of a strangulation happening, before any further descent either of the testis or bowels, has taken place, is proved by several facts upon record. Thus Reichel saw a boy, about four years old, whose scrotum was yet empty, in whom the ileum was strangulated with the testis at the abdominal ring¶; and Pelletan records the case of a congenital hernia, where the testis lay at the upper and outer part of the ring. The rupture was always easily reducible, and when the patient was sixteen, the bowels after being returned, did not protrude again till he was nineteen years old. This event was attended with some pain, but still the hernia admitted of being reduced with ease. One day, however, it could not be got up again, and became strangulated: — but, on the following day, the bowel was reduced in the Hotel Dieu. The patient felt some relief; but the pain did not entirely cease, and the vomiting continued; the testis being prominent at the external side

* Meckel, *Tractatus de Morbo Hernioso Congenito Zimmermani*.

† See Plate 14. Fig. 1. Taken from Scarpa.

‡ I. Cloquet *Recherches sur les Causes et l'Anatomie des Hernies Abdominales*, Ob. 78, p. 102. 4to. Paris, 1819.

§ Sandifort, *Icones Herniæ Inguinalis Congenitiæ*, p. 15. See Plate 13, Fig. 2, at the end of this volume.

¶ See Pott's *Chirurgical Works*, vol. ii. p. 117. edit. 1808.

¶ Ludwig, *Advers. Medic. Pract.* vol. iii. p. 736, 737.

of the ring. Although the hernia, after falling down and being once more reduced, did not make its appearance again, the patient got worse and worse, and died on the fourteenth day. Before death, the prominence of the testis was remarked to be greater than usual. On dissection, besides the general marks of inflammation in the abdomen, a noose of the ileum was found strangulated by the pressure of the testis within the ring. *

When, in the instance of a protrusion of the intestines into the upper part of the tunica vaginalis, the testis happens to be nearly or quite on the outside of the ring, the occasional employment of gentle pressure is recommended, in order to promote the descent of that gland into the scrotum. According to Richter, this is the only chance of preventing the rupture from becoming strangulated, and that when it fails, (supposing the symptoms should be urgent,) an operation is the only resource. † Here the knife must be used with particular circumspection, lest the testis be injured; an accident, of which there would be great risk, if that body were adherent, as it frequently is, to the protruded bowels. In operating upon a patient in the foregoing state, it does not appear to me, (though it did so to Richter,) that our aim should be to make the testis pass either further down, or back again into the ring, for the purpose of enabling the patient to wear a truss. But if we are obliged to use the knife, I conceive our interference should be limited to the great indication of liberating the strangulated viscera, and effecting their reduction; for, when their constriction is removed, the immediate source of danger is obviated, and nature undisturbed will best do the work of bringing the testis down into the scrotum. With regard to pushing the testis back again, the plan is altogether so objectionable as to need no comment: nor can my sentiments on this point be at all changed by the fact, that Arnaud once adopted this sort of practice with success.

These remarks apply to cases, in which an operation is undertaken; and, where we have it in our power at all events by means of it to remove the stricture. But things are very different when the knife is not used; and, perhaps, then certain modes of proceeding with respect to the testis may be right and necessary, in order to liberate the hernia, without the hazard of an operation, which mode would be highly wrong, were the risk of such operation to be encountered.

* See Pelletan's *Clinique Chirurgicale*, tom. iii. p. 394.

† *Anfangsgr. der Wundarzn.* b. v. p. 436.

Thus, cases present themselves, where the testis lies so far within the ring, that it can scarcely be felt externally; yet, gradually, or from some very slight cause, it protrudes in a more sudden manner, and immediately brings on symptoms of strangulation: here I should not find fault with the practice of trying to get rid of the strangulation by pressing the testis back again; a thing, which Richter says can generally be accomplished without difficulty.*

It has been already observed, that the upper part of the peritoneal canal is generally closed and obliterated soon after the passage of the testis into the scrotum. This disposition of the canal to close is also sometimes evinced in cases of hernia. Several contracted points, as indeed I have already noticed, may occasionally be remarked in the neck of the sac of a congenital hernia, and these may even be the cause of strangulation.† In such circumstances, the surgeon must have especial care (for every thing depends upon it) to lay open the hernial sac its whole length up to the ring, in order to set the parts free, and this being done, there will frequently be no necessity for dilating the ring itself.‡

The treatment of a congenital inguinal hernia is to be conducted on the same general principles which apply to other ruptures. A radical cure is often easy of accomplishment; for, after the viscera are reduced, the passage, or communication between the abdomen and scrotum, has a natural tendency to close, and in young persons will always do so, provided care be taken to prevent the bowels from descending again by the regular and uninterrupted use of a well-made truss. If the patient be young, the cure may even be completed in the course of a few weeks.§ This facility of cure, however, diminishes as the individual grows older, and, after the adult age, little expectation can be indulged, that the patient will ever recover so perfectly as to enjoy security, without the constant employment of a truss. As Mr. Pott has correctly stated, a piece of intestine, or omentum, may get pretty low down in the sac, while the testis is in the groin, or even within the

* Anfangsgr. der Wundarzn. b. v. p. 437.

† "I have seen such stricture made by the sac of one of these herniæ, as produced all those bad symptoms which render the operation necessary; and I have met with two different strictures at near an inch distance from each other in the body of a dead boy, about fourteen, one of which begirt the intestine so tight, that I could not disengage it without dividing the sac." Pott's Chirurgical Works, vol. ii. p. 118.

‡ Richter, vol. cit. p. 438.

§ Arnaud.

abdomen. In these cases the application of a truss would be highly improper; for, in the latter, it might prevent the descent of the testis from the belly into the scrotum; in the former, it must necessarily bruise and injure it, give a great deal of unnecessary pain, and can prove of no real use. Such bandage, therefore, ought never to be applied, unless the testis can be fairly felt in the scrotum, after the bowels are replaced. *

In young subjects, in whom no congenital hernia actually exists, but one or both testes have not yet passed the ring, their descent should be watched, because it is a period when a tendency to a hernial protrusion must prevail. Here, as soon as the testis has got some way below the ring, a truss, of a construction that will not hurt the testis, should be applied, with a view of preventing a hernia, and aiding nature in the process of obliterating the communication between the abdomen and scrotum. When, however, a hernia takes place in a patient whose testis has not descended, and whose age makes it doubtful whether it ever will descend, or such descent be advantageous, Mr. Hunter thinks a truss should be applied immediately the bowels are reduced. †

In the operation, the surgeon should remember, that the testis will often be found between the intestine and omentum; that, after their reduction, it will be left quite bare in the exposed cavity of the sac; and that, as it is a part very sensible and prone to inflammation, it should never be unnecessarily handled and disturbed; a mode of proceeding which may have very unpleasant consequences in irritable constitutions. Indeed, I should here recommend surgeons to listen to the advice of Mr. Lawrence, who says the hernial sac should never be laid open below the upper part of the testis, unless the freeing of the protruded bowels from adhesions were to render a more extensive exposure of the cavity of the tunica vaginalis indispensable. ‡

The sac of a congenital rupture is frequently very thin; sometimes so thin, and at the same time so firmly adherent to the skin, that both parts are opened together by the same stroke

* Pott's Chirurgical Works, vol. ii. p. 117. edit. 1808.

† Observations on certain Parts of the Animal Economy, p. 17.

‡ Lawrence on Ruptures, p. 476. edit. 3. In an example related in a modern work, delirium and a severe inflammation of the testis, with a large abscess on each side of the scrotum, followed an operation for congenital hernia. As there were some slight adhesions between the testis and the protruded small intestine, it had been necessary freely to lay open the tunica vaginalis. See Pelletan's Clinique Chirurgicale, tom. iii. p. 84, &c.

of the knife. Here the inexperienced surgeon may wrongly suppose that he had no hernial sac at all to divide *; while its delicacy and close adhesion to the integuments were the only causes which concealed it from his observation. This thinness of the tunica vaginalis, in cases of congenital hernia, is particularly noticed by some of the most correct surgical writers. Scarpa remarks, that the sac is not thicker than the rest of the peritoneum†; and according to the statements of B. Bell‡ and Meckel§, it is rather thinner than the sac of a common inguinal hernia. || The knowledge of this circumstance, I need hardly observe, dictates the necessity of caution in the first steps of the operation.

Pott¶ and Wilmer** believed, that the congenital inguinal hernia was more subject than a common bubonocoele, to that kind of strangulation which is caused by the neck of the hernial sac. Out of five congenital herniæ which Wilmer operated upon, three were strangulated from such a cause, and not at all by the ring. Sandifort†† remarked the same thing in the body of a young man who had died of a strangulated congenital hernia: the operation having proved ineffectual, in consequence of the surgeon neglecting, as he dilated the ring, to divide the neck of the hernial sac, which was the principal seat of the strangulation. In a case which was dissected by Dr. A. Monro, junior, there was a stricture in the middle of the peritoneal canal, and a part of the omentum, which descended below the constriction, was of unnatural bulk. ‡‡ Professor Scarpa's experience has not yet enabled him to offer any opinion for or against the correctness of the sentiment delivered by Pott and Wilmer; but he thinks it has much probability, since the neck of the tunica vaginalis is naturally disposed to be obliterated, and must therefore have a greater tendency to contract, than the accidental production of peri-

* Arnaud, Mém. de Chirurgie, tom. i. p. 52.

† Traité Pratique des Hernies, p. 76.

‡ System of Surgery, vol. i.

§ Tractatus de Morbo Hernioso Congenito Zimmermanni, p. 23. and 28.

|| "Comprehenditur, membranam, peritonæo continuam, partes, abdominis cavo elapsas, nunc continentem, ubi tumor ad insignem magnitudinem increscit, maxime extendi, attenuari, cum cute concredere, confundi posse, sic ut nullus adesse videatur saccus." Edvardi Sandifort Icones Herniæ Inguinalis Congenitæ, p. 24.

¶ Chirurg. Works, vol. iii. p. 292.

** Practical Obs. on Herniæ, p. 3.

†† Museum Anat. Acad. Lugdun. vol. ii. tab. 91. 92.

‡‡ Monro's Morbid Anatomy of the Human Gullet, Stomach, and Intestines, p. 409.

tonæum constituting the sac of a common inguinal hernia. On one point, however, he can speak more decidedly; viz. that of the two varieties in the contraction of the neck of the hernial sac, one of which represents a kind of tube extending through the inguinal canal, and the other a simple, narrow, circular band, corresponding to the external orifice of the ring, the first is much more frequently met with in the congenital, than the common inguinal hernia. *

The parts are often girt by a contraction of the hernial sac, not only where it communicates with the abdominal cavity, but also in other situations, where we should not have expected this occurrence. † Such constrictions occasionally form even towards the lowest part of the sac: a case indeed uncommon; but, when it does happen, likely seriously to embarrass a surgeon not apprised of its possibility. In this manner, the inferior part of the sac of a congenital hernia may become completely shut up, so as to leave the tunica vaginalis a distinct and separate cavity. When this separation is accomplished, the bowels are no longer contained in the same cavity with the testis; and the rupture, which was at first congenital, is now changed into a case not very different from a common bubonocoele. This observation, with a case illustrative of it, I find in the work of a modern writer, who has availed himself of the extraordinary opportunity of dissecting nearly six hundred subjects afflicted with herniæ. ‡

Some of the most interesting examples of these contractions of the body of the hernial sac, are to be found in the writings of Pott§, Wrisberg||, Scarpa¶, Pelletan**, and Cloquet.††

In operating upon congenital herniæ, therefore, we should be aware, that the protruded bowels may be strangulated by a contraction of the neck, or even of the body of the hernial sac, while the abdominal ring itself may have no share in producing the evil. Where, however, it is requisite to dilate this opening, the incision may always be made with perfect safety, either directly upwards, or upwards and outwards; the displacement of the epigastric artery to the inner side of the neck of the hernia being regular, and constant in its occurrence, for reasons already detailed.

* Scarpa, *Traité Pratique des Hernies*, p. 118.

† Lawrence on Ruptures, p. 477. edit. 3.

‡ J. Cloquet, *Recherches sur les Causes et l'Anatomie des Hernies abdominales*, p. 60. obs. 37. 4to. Paris, 1819.

§ *Chirurgical Works*, vols. ii. and iii.

|| Comment. Reg. Soc. Scient. Goetting. 1778. ¶ Op. cit. p. 119.

** *Clinique Chir.* t. iii. p. 108. & 335. †† Lib. cit. obs. 69. p. 89, &c. &c.

Sometimes an aqueous fluid collects in the sac of a congenital hernia, either with, or without a protrusion of the viscera, forming a true hydrocele of the tunica vaginalis*, but attended with the peculiarity, that the water can be pressed back into the abdomen. According to Mr. A. Cooper, when this complication attends a hernia, it may be ascertained by returning all the contents of the tumour into the cavity of the abdomen, when the patient is in a horizontal posture, and then on putting the finger against the abdominal ring, and letting the patient stand up, the water will insinuate itself into the scrotum, so as to produce a kind of hydrocele: if the pressure of the finger is now diminished, and the patient is desired to cough, the intestine and omentum will be felt falling down into their former situation. In young subjects, the fluid is in the end generally absorbed, and, at all events, there can be no urgency for proceeding to any operation on its account. †

The pervious state of the peritoneal canal, and the descent of the bowels into the same cavity with the testis, do not appear to render the patient altogether exempt from the possibility of the peritonæum becoming dilated into a hernial sac through the abdominal ring, and thus a double rupture may be produced on the same side. ‡

Female children may be affected with a kind of inguinal hernia, termed also congenital §, from the circumstance of the sac, into which the protrusion is made, being already formed at the period of birth, and its appearing to have some analogy in this respect to the tunica vaginalis. It is a case, however, far less interesting to the practical surgeon, than the congenital inguinal hernia of the male subject; for it is extremely rare, so uncommon indeed, that Sandifort doubts whether an example of it has ever been seen ||, nor can it be distinguished from a common bubonocoele. Nuck remarked, in some female infants, a canal, composed of peritonæum, issuing from the abdominal ring, and terminating in a cul-de-sac. Such diverticula of the peritonæum, as he termed them, rarely exceeded half an inch in length; nor were they by any means constant. ¶ Wrisberg, who more recently prosecuted the inquiry, found

* Lobstein de Hernia Congenita, p. 7. and 8. Baader, *Observ. Med. Incisionibus Cadaverum Anatomicis illustratæ*, obs. 8. in *Thesaur. Dissert.* vol. iii. p. 10.

† Richter's *Anfangsgr. der Wundarzn.* b. v. p. 439.

‡ Eduardi Sandifort, *Observat. Anatom. Patholog.* lib. i. cap. 4. p. 71.

§ Arnaud.

|| Lib. cit. p. 25: "An talem autem exemplum annotatum sit, dubito."

¶ *Adenographia Curiosa*, cap. 10.

these diverticula existing in nineteen out of two hundred female bodies which he had an opportunity of * examining. In two cases of ascites, Mr. A. Burns found these diverticula so much enlarged, as to admit of the introduction of the thumb. He had seen seven cases of congenital inguinal herniæ in females, and in six of these, the anterior side of the inguinal canal was deficient. † Although we cannot see for what purpose these cul-de-sac processes of peritonæum are intended, Richter thinks, that the fact of their being so common not only explains to us the origin of congenital inguinal hernia in females, but accounts for their being also subject to bubonocoele in their early years; a disposition which decreases at a later period ‡, when the crural hernia is that to which they are principally liable. § Hence he deems it probable, that such diverticula also resemble the process of peritonæum, destined to become the tunica vaginalis, in the additional circumstance of the communication between them and the general cavity of the peritonæum being diminished, or closed, as the child advances in age.

CHAPTER III.

OF HERNIÆ OF THE CÆCUM AND COLON.

A SATISFACTORY account of some particulars, relative to these herniæ, I believe, has not yet found its way into any of our modern systems of surgery, though justice and candour

* Comm. Med. Physiol. vol. i. p. 254, and Lawrence on Ruptures, p. 483. ed. 5.

† Monro on the Morbid Anatomy of the Human Gullet, Stomach, and Intestines, p. 514.

‡ Bubonocœles are occasionally, but not often, seen in women. Several, which were dissected by Cloquet, are related by him in his "Recherches sur les Causes et l'Anatomie des Hernies abdominales," 4to. Paris, 1819. See obs. 13. p. 32; and obs. 20. p. 44. This last case, which was on the left side, was remarkable, on account of the ligamentum rotundum uteri on the right side being accompanied with the diverticulum described by Nuck, which was an inch and a half in length. In the body of another female, aged about fifty, Cloquet found two external inguinal ruptures. See obs. 24. p. 48. Other examples of external inguinal ruptures in women are also recorded at p. 107. 132. 140, &c. and an internal inguinal hernia in the body of an aged female, p. 116. 143, &c.

§ Richter, vol. cit. p. 439.

oblige me to own that the subject was long ago well understood by John Hunter *, and is correctly represented in the writings of several eminent continental surgeons, and also in Mr. Lawrence's excellent Treatise on Ruptures. No well-informed surgeon can doubt that herniæ of the fixed parts of the cœcum and colon, have as strong a claim to separate consideration as ruptures formed by the urinary bladder, their differences from common herniæ being on various accounts remarkable, and highly interesting in practice. These reflections induce me to avail myself of the present edition of this book, as a means of rendering the nature of herniæ of the cœcum and certain parts of the colon more familiarly known to the English professional reader.

In the first place, the nature of the adhesions which occur in certain herniæ of the large intestines, is such as to merit the serious attention of the practical surgeon; for they have no analogy to the preternatural adhesions met with in other herniæ, which are the result of adhesive inflammation, for they are actually composed of the same bands which naturally fix the bowel in the cavity of the abdomen, and which have been carried with it into the scrotum. The importance of being aware of this fact is self-evident; for, were such adhesions to be regarded and treated in the same way as those connections which arise from the effusion and organisation of coagulating lymph, and which are not unfrequently divided with the scalpel in the progress of the operation, the want of discrimination might have very unpleasant and dangerous consequences; a truth, of which the reader will be presently better qualified to judge.

The *natural fleshy adhesion*, as it is called by Scarpa, is not observed in all scrotal herniæ, but only in those of the large

* Speaking of the manner in which the peritonæum is drawn down as the testis descends into the scrotum, Mr. Hunter remarks, "This peculiarity of descent often takes place in some of the intestines; but can only happen in those which have adhesions to the loins. This I suspect is only to be met with in old ruptures; never happening at the first formation of the hernial sac, in which the intestine lies; and I should suppose could only form very gradually. The cœcum has sometimes been found to have descended into the scrotum, and to have brought along with it the adhesions through its whole course. The same thing has happened to the sigmoid flexure of the colon; and I have found the whole of it in the left side of the scrotum. Such herniæ cannot be reduced; and, in case of strangulation, which may be brought on by a fresh portion of intestine coming down, are not to be treated in the common way; the sac should not be opened, but the stricture divided, and the newly-protruded part reduced." Obs. on Certain Parts of the Animal Œconomy, p. 11.

intestines, that is to say, in scrotal ruptures on the right side, which are formed by the cœcum, the appendix vermiformis, and the beginning of the colon; and in such herniæ on the left side as contain the sigmoid flexure of the colon. It is well known, that, in the natural state, the cœcum and the ascending colon are very firmly fixed in the right ileo-lumbar region of the great sac of the peritonæum, by means of two folds of this membrane, one of which is attached to the os ilium, and the other to the external margin of the psoas muscle. Yet, it is by no means uncommon to find the whole of this portion of the large intestines out of the abdominal ring, and protruding quite to the bottom of the scrotum, dragging along with it the part of the great bag of the peritonæum to which it is attached, and consequently the two folds of the same membrane, already mentioned.*

OF THE NATURAL ADHESIONS FOUND IN SCROTAL HERNIÆ
OF THE RIGHT SIDE.

In dissecting scrotal herniæ of the right side, formed by the cœcum, the appendix vermiformis, and commencement of the colon, Professor Scarpa has several times remarked, that these bowels had drawn after them into the scrotum the layer of peritonæum, by which they were naturally fixed in the right flank, so that this portion of the great bag of the peritonæum contributed to the formation of the hernial sac, on opening which, the intestines were seen connected to its parietes, just as they were in the cavity of the abdomen previously to their displacement.†

Scarpa has been enabled, by repeated anatomical examinations, to trace, as it were, the progress of nature in the formation of herniæ of the cœcum and right colon. He found in a male subject fifty years of age, an inguinal hernia of the right side, as large as a hen's egg, containing merely the fundus, or unfixed portion of the cœcum. The fold of peritonæum, which fixes this bowel in the lumbar region, had already undergone very considerable displacement, having descended to within an inch of the abdominal ring: but, as it had not yet got into the hernial sac, the intestine was very easy to reduce. In another individual, Professor Scarpa found the same species of hernia advanced a degree further: the whole

* See Plate 14. fig. 2. and Plate 15. fig. 1.

† *Traité Pratique des Hernies*, p. 166, 167.

of the cœcum was contained in the hernial sac, together with the appendix vermiformis and beginning of the colon. The external side of the neck of the hernial sac was evidently formed by the portion of peritonæum, which in the natural state invests the ileo-lumbar region: the cœcum and beginning of the colon were attached to this part of the parietes of the sac by the same duplicatures of peritonæum which naturally bind them down in the right flank. * An adhesion of a precisely similar nature united the appendix vermiformis † to the portion of hernial sac corresponding to the little mesentery of this appendix. ‡ It was impossible to reduce the cœcum and beginning of the colon completely, because the above-described adhesions reached about two inches below the abdominal ring. In a third subject, a man sixty years of age, who had died with a very large old scrotal hernia of the right side, Professor Scarpa found in the hernial sac not only the cœcum and beginning of the colon, but also the extremity of the small intestines: all these viscera together composed a considerable mass, by which the scrotum was distended. § The duplicatures of peritonæum, constituting the natural attachments of the cœcum and beginning of the colon, were also manifestly seen forming a part of the hernial sac, and extending to the peritoneal coat of these viscera ||, so as to make what Scarpa has named a natural fleshy adhesion. The fundus of the cœcum was free and unattached, as it naturally is in the cavity of the abdomen: one could also make it reascend a little towards the ring; but all the rest of this bowel, as well as the beginning of the colon, was so intimately and extensively adherent to the parietes of the hernial sac, that it was quite impracticable to reduce them. Scarpa further observed, that the fundus of the cœcum ¶, that is to say, all its unattached portion, had undergone considerable enlargement, and descended to the bottom of the scrotum. This is what happens in all herniæ of this description, in consequence of the accumulation of fecal matter in the cœcum, a certain effect of the atony of this bowel, and of the weakness of the contractions of the cremaster muscle, which are incapable of counterbalancing the pressure made by the abdominal muscles. When the belly of this subject was opened, the right colon was seen very much approximated to the groin, as well as the fold of peritonæum serving for its attachment.**

* See Plate 15. fig. 1. b, c.

† See Plate 15. fig. 1. g, h, i.

‡ See Plate 14. fig. 2. b, b, a, a.

** Scarpa, op. cit. p. 168—170.

† See Plate 15. fig. 1. d, e, f.

§ See Plate 14. fig. 2.

¶ See Plate 14. a, a.

OF NATURAL ADHESIONS IN SCROTAL HERNIÆ OF THE LEFT SIDE.

What Professor Scarpa calls the natural fleshy adhesion of the large intestines to the hernial sac, may also take place in a scrotal hernia of the left side*, when the protrusion consists of that portion of the colon which is naturally fixed in the left ileo-lumbar region of the great bag of the peritonæum. It is well known, that the left lumbar colon is attached on one side to the mesocolon, and on the other to the layer of peritonæum investing the ileo-lumbar region, by means of broad membranous duplicatures composed of peritonæum itself: these duplicatures accompany the bowel to the place where it crosses the iliac vessels, as it passes towards the pelvis to form the commencement of the rectum. When the portion of the colon, which is situated above the iliac vessels, descends into the scrotum, the hernial sac† will necessarily consist of the layer of peritonæum lining the ileo-lumbar region, and consequently of the folds of this membrane‡, which served to fix the bowel in its natural situation. In this species of hernia, as well as in that which is composed of the cœcum, a portion of the great intestine will always be found connected to the hernial sac § by the same bands which fixed it in the cavity of the abdomen.||

Scarpa has also dissected a very large scrotal hernia, containing in addition to the left colon, which was fixed to the hernial sac by its natural attachments, a considerable portion of small intestine, which had not the slightest adhesion to the sac.

CAUSES OF HERNIA OF THE CŒCUM.

The knowledge, says Scarpa, which now prevails, respecting the proximate and remote causes of herniæ, renders it quite intelligible how the cœcum, notwithstanding the firm manner in which it is bound down in the ileo-lumbar region, may in certain cases descend into the scrotum, sooner than the small intestines. This must happen, when a preternatural looseness of the fold of the peritonæum, which fixes the cœcum, is

* See Plate 15. fig. 2.

† Plate 15. fig. 2. e, e.

‡ Plate 15. fig. 2. c, c, c, c.

§ Plate 15. fig. 2. a, b, d, c, c, c.

|| Monteggia, Fascicul. Patholog. p. 91. 93. Scarpa assures us, that this celebrated surgeon has often seen the kind of adhesion here described, in scrotal herniæ containing either the cœcum, or the left lumbar colon.

conjoined with a weakness of the aponeurosis of the right external oblique muscle. The abdominal muscles and diaphragm make equal pressure upon all the viscera of the belly; but, in the circumstances suggested by Scarpa, the cœcum and beginning of the colon will be more disposed to yield to this pressure and protrude, than any other part of the intestinal canal. Large accumulations of indurated fecal matter in the cœcum may materially increase this tendency to displacement. Scarpa is also not disinclined to think, that a hernia of the cœcum may sometimes be consequent to that of the extremity of the ileum, which having descended into the scrotum the first, may have successively drawn after it the cœcum with its appendix, the beginning of the colon, and the membranous folds constituting the attachments of these viscera. When the hernia of the cœcum is congenital, Scarpa believes, that there is every reason for presuming, that the disease has been occasioned by an adhesion, which the testis contracted with that intestine previously to its descent into the scrotum. Wrisberg, in dissecting foetal subjects, whose testes were still in the cavity of the abdomen, several times remarked a sort of fibrous substance, or membranous ligament, one end of which was connected to the right testis, near the entrance of the spermatic vessels, and the other to the cœcum, the end of the ileum, and to the little mesentery of the appendix vermiformis.* Scarpa then quotes a case from Sandifort †, where the testis had become adherent to the appendix vermiformis cœci before birth, or the protrusion of the bowel.

SCARPA'S OPINIONS ON CERTAIN HERNIAE, WHICH SOME SURGEONS AFFIRM TO HAVE BEEN DESTITUTE OF A HERNIAL SAC.

A scrotal hernia, formed by the cœcum, the appendix vermiformis, and beginning of the colon, is constantly of a very considerable size; but the case cannot be recognized by this character, and even in the operation itself, it is attended with appearances well calculated to produce mistake. In fact, after dividing the integuments, one might be led to suppose that the hernial sac was either lacerated, or entirely deficient: but if attention be paid to the natural situation of the cœcum and beginning of the colon in the right ileo-lumbar region, and it be recollected, that these bowels are partly situated out of the peritonæum, it will at once appear clear enough, that, in a her-

* Observ. Anat. de Test. descensu, p. 52.

† Icones Herniæ Congenitæ.

nia, they can only be in part surrounded by a hernial sac, a portion of their external side being in immediate contact with the adjoining cellular substance. In such a case, were an uninformed practitioner to direct his incision a little too much towards the outer side of the tumour, he would find the cæcum and colon immediately under the cremaster, and be induced to believe, that these bowels had no hernial sac. But, says Scarpa, he would quickly recover from his mistake, if he were to cut into the hernia on the middle line, or on its internal side; for then he would be sure to find under the cremaster and subjacent cellular membrane, the true hernial sac, containing the greatest part of the cæcum with the appendix vermiformis. At the same time, he would remark a broad membranous fold, extending from the parietes of the sac to the surface of the intestine, of which a small part is on the outside of the hernial sac, just as it was on the outside of the cavity of the peritonæum in the right lumbar region. In dissecting a very large hernia of this description, Scarpa found the viscera so turned on their axis, that their adhesion to the sac was situated in front, and in order to lay open the sac, it was necessary to make a fresh incision at the inner side of the swelling. It is to such an arrangement of the parts, that Scarpa imputes the great mistake made by Sernin *, when he fancied he had positively ascertained by dissection the existence of scrotal herniæ, destitute of a hernial sac, an error, into which even the justly celebrated Desault and Chopart † fall, when they speak of finding the cæcum directly under the skin of the scrotum, without having the least suspicion, that the greatest part of this bowel is included in a peritoneal hernial sac, like a common hernia. ‡

REASON WHY CERTAIN HERNIE OF THE CÆCUM ARE
REDUCIBLE, WHILE OTHERS ARE NOT.

In explaining this question, Scarpa reminds us of the well-known difficulty, and even occasional impossibility, of reducing a large scrotal hernia, when formed by the cæcum, the appendix vermiformis, and beginning of the colon, owing to the strong adhesion which these bowels contract to the hernial sac. Yet, says he, nobody § has hitherto remarked, that such adhesions are not formed by any preternatural connection, but only by the folds of peritonæum which, in the natural state, fixed the upper portion of the cæcum in the right ileo-lumbar

* Journ. Génér. de Médecine, par Sedillot, t. xvi. p. 302.

† Traité des Maladies Chir. t. ii. p. 209.

‡ Scarpa, Traité Pratique des Hernies, p. 174—176.

§ The reader will be aware, that Mr. John Hunter should have been excepted from this observation.

region; nor has any one satisfactorily explained why in some inguinal, or scrotal herniæ of the cœcum, adhesions, unpreceded by any inflammation, prevail betwixt this intestine and the hernial sac. Not the least attempt has been made to investigate the cause, why herniæ of this description, which are recent and of small size, may be easily reduced, while larger cases are irreducible, and always complicated with intimate adhesions to the hernial sac. The reason of this difference, says Scarpa, may be readily deduced from the foregoing explanations; in the first case, the hernia merely consists of the cul-de-sac of the cœcum; and as this part of the bowel is completely unattached in the abdomen, it is generally so in the hernial sac. On the contrary, in the second case, the whole of the cœcum, with a part of the colon, being included in the hernia, and the natural attachments of these viscera making part of the hernial sac, the consequence is, that they are fixed at the bottom of the scrotum, in the same manner as they were in the right flank previous to their displacement.*

OF THE TREATMENT WHEN A HERNIA OF THE CÆCUM IS
COMPLICATED WITH ADHESIONS AND GANGRENE.

Professor Scarpa cites at full length a case of this description recorded by Arnaud †, whose mode of treatment was not altogether judicious. The case proves, says Scarpa, that Arnaud himself was not well acquainted with the true nature of that kind of adhesion which has the epithets of natural and fleshy applied to it. Had he well understood it in the instance adverted to, he would not have employed an hour and a quarter in cutting, without any utility, the adhesions and bands, which united the cœcum and the colon to the sides of

* Scarpa quotes an interesting case from the writings of S. L. Petit, who, in operating upon a hernia of the cœcum, mistook the above-described natural adhesions of the bowel to the sac for thickened mesentery, not being precisely acquainted with the anatomy of the case. His practice, however, was right and judicious; for, after dilating the stricture, and reducing a protruded piece of the ileum, he made no attempt to divide the connections of the cœcum, but leaving it unreturned, brought the edges of the wound lightly together. Had he cut through these natural adhesions, with a view of being able to reduce the cœcum, hemorrhage within the belly would have followed the reduction, and the patient probably fallen a victim to inflammation of the intestinal canal. This case of Petit's will always be memorable also on another account; viz. as evincing the possibility of saving the patient's life, when in operating on a scrotal hernia, the viscera cannot be reduced, after the removal of the stricture. See Petit's *Traité des Maladies Chir.* t. ii. p. 352.

† A Dissertation on Hernias, part 2. obs. 17.

the hernial sac; but he would have restricted his interference to that treatment, which is indicated in cases of irreducible mortified herniæ. As for the ligature of the vessels of the mesentery and mesocolon, besides its great difficulty, experience proves, that we can never tie with sufficient exactness all those vessels to be entirely free from the danger of hemorrhage during or after the excision of the intestinal mass. On the other hand, observes Scarpa, neither the twisted state of the bowels, nor their partial gangrene, are adequate reasons for cutting them away down to a level with the abdominal ring; but it is far more beneficial and safe to be content with simply making an outlet for the feces, by dividing lengthwise the gangrenous portion of intestine, and with it the neck of the hernial sac, and the abdominal ring. All the mass of irreducible bowels is to be left *in statu quo*, and fomentations applied to them. The mortified parts will then gradually separate from the living, which latter afterwards throw out granulations, and become confounded with the integuments in forming the cicatrix. On the contrary, were we to imitate Arnaud, and cut away all the mass of intestines that we could not return, we should unavoidably wound the living parts, and run great risk of exciting violent inflammation, not only in the hernia, but also in the whole of the intestinal canal. *

SYMPTOMS CHARACTERISING HERNIA OF THE CŒCUM.

As professor Scarpa has remarked, whenever an operation is to be done on a large, old scrotal hernia of the right side, the first thing which the surgeon should consider, is whether the disease is not produced by the cœcum and beginning of the colon. Besides the size and long standing of the tumour, its irregular knobby shape may excite a suspicion of such a complication. The probability of the occurrence will be increased, if it be found, that while the hernia was confined to the groin, it was always capable of reduction, but that after its descent into the scrotum, though never attended with symptoms of inflammation, or strangulation, it could no longer be returned, at least completely; if it be ascertained, that whenever the swelling became larger, the patient was often annoyed with colic complaints, the termination of which always coincided with the subsidence of the tumour; and was

* Scarpa, *Traité Pratique des Hernies*, p. 186.

accelerated by the use of aperient medicines and clysters; if the patient should have experienced habitually after digestion, and a little while before going to stool, a sensation of heaviness and dragging in the scrotum; if a depression proportionate to the size of the hernia be observable in the right iliac region: and lastly, if the strangulation should appear to have been brought on by great excess in regimen, and an accumulation of ill-digested aliment, rather than by any effort, that has forced an additional portion of bowel into the tumour.

In considering the diagnosis of herniæ of the cœcum, one or two circumstances, pointed out by my friend Mr. Lawrence, are particularly entitled to attention, as affording a valuable criterion: these descents, says he, must take place gradually; the displacement of parts, connected as the cœcum and colon are in their natural situation, must be a slow process; and, consequently, herniæ formed suddenly by any accidental cause, or violent exertion, cannot be of this kind. *

In this species of hernia, as well as in all others of large size, the symptoms of strangulation are hardly ever violent, either on account of the width of the neck of the hernial sac and abdominal ring, or the relaxation and looseness of the aponeurosis of the external oblique muscle. In every case, it is a matter of the first-rate importance not to confound the symptoms of strangulation with those of colic and irritation, proceeding from the adhesion of the bowels to the hernial sac. When a large old scrotal hernia becomes strangulated, the evacuations from the bowels are always totally suppressed; the swelling is painful; and the patient is affected with vomiting, hiccough, and fever. On the contrary, in the colic from irritation resembling strangulation, the discharge of feces and air from the rectum is never entirely suppressed; and these evacuations are increased when mild purgatives and clysters are exhibited. If nausea, and tendency to vomiting occur, it is at long intervals; strictly speaking, there is no fever; and the swelling, though tense and bulky, is not painful on being handled. Under such circumstances, mildly aperient salts, repeated clysters, and cold applications to the hernia, may be employed with considerable success, and the surgeon should not be in too much haste to have recourse to the operation.

But, if a hernia of the cœcum, of long standing and great size, were to be really strangulated, so that the only chance of saving the patient's life depended upon the performance of the operation, the surgeon, before undertaking it, should recol-

* Lawrence on Ruptures, p. 197. edit. 3.

lect, that the bowels contained in the tumour do not admit of being completely returned into the abdomen, by reason of the particular connections which they have with the hernial sac; and that in this case, as well as in all scrotal herniæ of large size, the neck of the hernial sac is never the immediate seat of strangulation. If there be no indication of gangrene, says Scarpa, he is to be content with exposing the abdominal ring, which he is to make a slight division of outwards, without cutting the neck of the hernial sac. By means of this simple incision, he will obviate the stricture, without exposing the bowels to the air. Afterwards, he is to endeavour to promote the passage of the feces and wind through the protruded bowels by means of gentle pressure on the swelling, and try to return the viscera, as far as practicable, into the abdomen. If, from inadvertence, from an apprehension of gangrene, or from mistaking the nature of the hernia, the operator should have opened the hernial sac, then the best mode of bringing the operation to a conclusion would be to adopt exactly the same conduct which was followed by the eminent Petit. Therefore, having removed the stricture, he should return into the belly such portion of the bowel as will admit of it, and cover the rest with the sides of the hernial sac and the integuments of the scrotum. The best applications will generally be fomentations, and light simple dressings; but whatever remedies may be indicated, external or internal, are not to be neglected. Under such treatment, the intestine, notwithstanding its adhesions to the hernial sac, will gradually return into the abdomen; and the portion which cannot do so, will granulate, and unite with integuments in forming the cicatrix. There will then remain in the groin merely a tumour, composed of the cul-de-sac of the cæcum, for the keeping of which from all pressure, and from becoming in time larger, the patient must wear during the remainder of his life a truss with a concave pad.

The preceding rules, laid down by professor Scarpa, as claiming attention in operations for herniæ of the cæcum, are equally applicable to all very large, irreducible scrotal herniæ. *

* Scarpa, *Traité Pratique des Hernies*, p. 186. 189.

CHAPTER IV.

OF CYSTOCELE, OR HERNIA OF THE BLADDER.

THERE are four different situations in which a hernia of the bladder may occur, namely, the abdominal ring, the crural arch, the perinæum, and the vagina. * Portions of the bladder have also been noticed, forming two distinct herniæ in the same patient; viz. a femoral and a vaginal hernia †, or a double inguinal rupture. ‡

The first of these cases, or the protrusion of the bladder at the abdominal ring, is the most frequent. It is sometimes termed *cysto-bubonocoele* §, and is alleged to occur more rarely in the left, than the right groin; a circumstance which several writers attempt to account for by the custom, which most individuals have of lying on the right side. || This disease is generally seen in male subjects, a large proportion of whom are considerably advanced in life, and have been repeatedly afflicted with retention of urine. Contrary to what is usual, however, a few instances are recorded, in which a protrusion of the bladder at the abdominal ring has been noticed in young persons ¶, and even in females. Thus the disease has been known to take place in a child, after a severe attack of pain arising from stone in the bladder. ** A young woman became troubled, in her pregnancy, with frequent desire to make water, and had great difficulty in retaining it: a swelling, not larger than a pigeon's egg, presented itself in each groin, but readily yielded to compression. She was advised to wear a compressive bandage, from which she obtained relief. †† In this example, we are expressly informed, that the

* I exclude from present consideration the very uncommon instances in which a portion of the bladder protrudes, either at the obturator foramen, or at the great ischiatic fissure; subjects which will be hereafter noticed.

† Levret sur les Polypes, p. 145.

‡ See Recherches sur la Hernie de la Vessie par M. Verdier, in Mem. de l'Acad. de Chirurgie, t. iv. p. 38 and 40. 12mo. a valuable and instructive essay, containing nearly every thing known, even at the present time, concerning protrusions of the bladder.

§ Dict. des Sciences Medicales, t. vii. p. 667.

|| Morgagni de Sedibus et Caus. Morb. cap. 30. epist. 92. and Verdier op. et. vol. cit. p. 71.

¶ Beaumont in Mem. de l'Acad. de Chir. t. iv. p. 28. edit. 12mo.

** Pott, Philosoph. Trans. vol. liv. ann. 1764. art. 9. p. 31.

†† Verdier, op. cit. p. 40.

protrusions took place through the rings ; an event which is to be considered exceedingly uncommon in a female patient.

It being perfectly well ascertained, that the inguinal cystocele may happen in infancy, a suspicion has originated, that the disease may even sometimes be congenital, and the bladder, like the intestines, slip into the canal formed by the unobliterated tunica vaginalis. It is thought also that this conjecture receives a degree of confirmation from a case reported by Arnaud. * But, whatever foundation there may be for suspecting the possibility of a congenital cystocele, I am not aware that the existence of such a case has ever been proved by dissection. The example visited by M. Beaumont, and referred to above, was also one that had prevailed from the earliest period of infancy.

It is well known, that the bladder is on the outside of the great bag of the peritonæum, and its fundus and a portion of its posterior surface, down to about the insertions of the ureters, are the only parts of it which are covered by this membrane. Now as it is usually the anterior and lateral part of the bladder which first passes through the ring into the scrotum, the peritonæum obviously will not protrude at the same time, and the displaced portion of the bladder can never be contained in a hernial sac. As, however, the cystocele gradually becomes larger, the fundus of the bladder at length descends into the scrotum, drawing along with it the peritonæum, that covers it. In a common enterocele, or epiplocele, it is always the production of peritonæum, termed the hernial sac, which precedes and contains the displaced viscera ; whereas, in an original inguinal cystocele, the viscus that forms the hernia first protrudes, and the sac follows it. Thus, in addition to the bladder, a hernial sac originates, into which a piece of intestine, or omentum, necessarily falls. Large cystoceles, therefore, are almost always conjoined with an epiplocele, or enterocele ; the bladder being invariably excluded from the other hernia, and situated at its posterior and internal side. Here the ordinary hernia is the consequence of the cystocele.

Sometimes the case is reversed, that is to say, the cystocele is the consequence of the other rupture. When a portion of intestine, or omentum, pushes the peritonæum down into the scrotum, and the hernia thus produced rapidly acquires a very large size, the peritonæum attached to the fundus of the bladder is sometimes dragged down into the scrotum, and, of course, along with it the fundus of the bladder itself. A bu-

* *Memoires de Chirurgie*, t. i. p. 79.

bonocele, taking place through the inguinal canal, gradually brings the upper opening behind the lower one; a change, that must greatly contribute to the possibility of the bladder being drawn through the ring in the subsequent increase of the swelling.* Thus a cystocele may originate, peculiar inasmuch as the fundus of the bladder is the part of this organ which first protrudes, while, in other inguinal cystoceles, it is always a portion of the side of this viscus that is first protruded. Probably, a cystocele of the foregoing description only happens when the original enterocele, or epiplocele, suddenly attains a very large size; for then the peritonæum, already composing the hernial sac, cannot yield so quickly and extensively as the circumstances of the case require, and the sac enlarges by drawing an additional quantity of this membrane out of the abdomen.†

The portion of the bladder protruded at the ring, and annexed to an omental, or intestinal hernia, is not contained in the same sac with the other viscera, but, in passing out of the ring, it glides between the posterior part of the sac and the spermatic cord.‡ It is observed by Mouton §, that all the double cysto-bubonocèles, with the histories of which he is acquainted, appear to have been simple protrusions of the bladder, uncomplicated with any intestinal or omental hernia; and, if this be generally true, he inquires, whether it may not depend upon the bladder not protruding under such circumstances, in either groin, sufficiently far to draw down the peritonæum in the form of a sac?

The symptoms of an inguinal cystocele are so plain and characteristic, that the disease cannot easily be mistaken. The hernial swelling becomes large and tense when the patient holds his water: it diminishes when the urine is discharged. If the scrotum be compressed, an inclination to make water is experienced. In certain cases, however, the swelling does not subside when the patient voids his urine; but, in these, if pressure be made on the scrotum immediately after the evacuation is finished, the patients instantly feel a desire to make water again. Many patients, in consequence of a paralysis || of the muscular fibres of the protruded blad-

* Lawrence on Ruptures, p. 505. edit. 3.

† Richter's Anfangsgr. b. vi. p. 33.

‡ Verdier, Mém. de l'Acad. de Chirurgie, t. iv. p. 75. edit. 12mo.

§ Dict. des Sciences Médicales, t. vii. p. 671.

|| Monro on the Morbid Anatomy of the Human Gullet, Stomach, and Intestines, p. 521.

der, cannot void their urine, unless they raise and compress the scrotum. In consequence also of the irritation which the bladder suffers in its unnatural position in the ring, a frequent inclination to make water is a very constant attendant on the disease. As the bladder is always drawn considerably to one side, and the course of the urethra is thereby rendered oblique, the patient is invariably troubled with more or less difficulty in making water, and sometimes he is afflicted with a total stoppage. Sometimes, in such cases, the catheter hardly admits of being introduced; and, after it has entered the bladder, the surgeon can distinctly perceive, that it has taken a very oblique direction to reach that viscus, running very much towards the side on which the hernia is situated. This is particularly manifest in female patients. In addition to the preceding symptoms, there is an evident fluctuation in the hernial tumour.

In former periods of the surgical art, when the nature of herniæ of the bladder was less familiarly known than at present, some strange mistakes were occasionally made in practice, in consequence of the swelling in the scrotum being confounded with other diseases. Even the intelligent M. Mery seems to have been, in one instance, completely deceived: he was called to a case, where a tumour of considerable size presented itself on the left side of the scrotum, attended with a palpable fluctuation, which led him to suppose it a hydrocele; but the patient at once extricated him from his error, for, by compressing the scrotum in his presence, he made the urine flow out of the urethra, and the supposed hydrocele entirely disappeared.* Although an inguinal cystocele has some resemblance to hydrocele of the tunica vaginalis, the two diseases may be easily distinguished from each other. The tumour, occasioned by the bladder, plainly extends into the ring; the common hydrocele never does so. In a cystocele, the testis can always be clearly felt below the swelling; in a hydrocele it cannot be felt at all. A cystocele diminishes when the patient voids his urine, or when the tumour is compressed: a hydrocele continues regularly of one size. In the latter disease, all the complaints of the urinary organs generally noticed in cystocele are absent.

A collection of fluid in the sac of a congenital hernia is a case, presenting more strongly than hydrocele some of the appearances of a cystocele; for, it not only extends within the ring, but, like the swelling formed by the bladder, may be

* Mem. de l'Acad. Royale des Sciences, 1713.

made to subside by compression. The entire absence of all complaints of the urinary organs, however, proves that the tumour can have no connection with the bladder.*

An inguinal cystocele has been mistaken for an abscess, and, under that idea, punctured. A peasant, after experiencing some difficulty in making water, had a retention of urine, and, not getting relieved, the swelling extended to the perineum, scrotum, and right groin: the spermatic vessels and testicle of the same side being at the same time enlarged. Acute pain was felt about the perineum and anus; and, as the swelling in the groin continued to grow larger, it was supposed by a country practitioner to be an abscess. Perceiving a fluctuation, he made an opening into it, when he was astonished to see urine, instead of pus, gush out of the wound. M. Guyon, a better informed surgeon, being consulted, judiciously recommended antiphlogistic remedies, and prevented the conversion of the wound into a fistula by drawing off the urine with a catheter, and making the patient lie on the opposite side to the disease.†

An inguinal cystocele has been mistaken for an indurated bubo. Cataplasms and emollient plasters were applied in vain; at length, the surgeon, tired of these experiments, determined to have recourse to more active treatment. Caustic was applied to the swelling, and an incision then made through the eschar; but how surprised was the surgeon on finding not only urine, but even a calculus in the sac which he had opened.‡

Plater, a physician at Bale, called to an urgent case of retention of urine, was examining the patient's scrotum, when he accidentally found a considerable swelling there, which he supposed might be the cause of the inability to empty the bladder: he, therefore, determined to remove it; but scarcely had he plunged his knife into it, when the urine gushed out, and the patient was relieved. As the catheter was not used, the wound afterwards became fistulous.§ Cases of an analogous nature are also mentioned by Vander Wiel.||

The instances mentioned by surgical writers of calculi making their way out in the groin by ulceration, and of the openings becoming fistulous, are justly set down by M. Verdier as only additional examples of the inguinal cystocele.

* Richter's *Anfangsgr.* b. vi. p. 35.

† *Mem. de l'Acad. de Chirurgie*, t. iv. p. 19. edit. 1^{mo}.

‡ *Op. et vol. cit.* p. 22.

§ *Ib.* p. 23. and Plater, *Obs. Libri Tres.* Basil. 1680, lib. iii. p. 830.

|| *Centur.* 1. obs. 90. and 91.

When this species of hernia of the bladder is uncomplicated, the nature of the case is obvious enough; but if it be conjoined with an enterocele, or epiplocele, there is more obscurity. When care is taken, however, to reduce the other hernia, the diagnosis is materially facilitated: supposing this to be impracticable, it should be recollected, that the bladder lies between the intestinal, or omental hernia, and the spermatic cord, in which situation, the fluctuation, and other signs of cystocele, are to be sought. *

Though the occurrence of cystocele is almost always to be referred to a considerable extension of the parietes of the bladder from frequent retentions of urine, M. Mery † and some other eminent practitioners have been inclined to adopt a different opinion, and to regard the complaint as an original malformation. This sentiment, as Verdier observes, is founded, 1st, On the little relative proportion between the considerable size which the bladder acquires from frequent retentions of urine, and the too narrow diameter of the rings through which it must pass to form an inguinal cystocele. 2dly, On the natural connections of the bladder, which appeared to Mery to afford complete security against its becoming displaced from the pelvis, its fundus being suspended to the umbilicus by the urachus, its sides attached to the umbilical arteries, the anterior part of its body joined to the aponeurosis of the abdominal muscles, and the posterior to the peritonæum.

Verdier readily admits with Mery, that the bladder cannot protrude at the rings, when it is full of urine; nor is it pretended that any protrusion of it happens in that condition, but only that the organ then acquires, as Petit ‡ remarks, a disposition to protrude at these apertures, when it becomes flaccid and empty. As for the attachments of the bladder, Mery knew very well, how capable they were of yielding, being nearly all of them of a membranous nature; and he actually communicated to the Academy of Sciences § a very remarkable specimen of such extension, some years before he felt this difficulty in admitting the possibility of a displacement of the bladder. In dissecting an aged male subject, he found the || cœcum,

* Richter's *Anfangsgr.* b. vi. p. 35.

† *Mém. de l'Acad. Royal des Sciences*, 1713.

‡ *Op. cit.* ann. 1717.

§ *Ib.* 1701.

|| Respecting this extraordinary displacement of the cœcum, however, Verdier judiciously notices that Mery omits to inform us, whether in the patient in question no transposition of the viscera existed; a *lusus naturæ* occasionally met with.

which is naturally situated and even bound down by the peritonæum in the right iliac region, in the left side of the scrotum, accompanied with a piece of the colon. On the question before us, says M. Verdier, I could adduce the testimony of the majority of patients afflicted with cystocele, and we should learn from them, that they experienced no inconvenience before a certain age, sometimes not before a very advanced period of life: the contrary would have happened, had the hernia always been an original malformation.

In order to explain the origin and progress of a hernia of the bladder, without supposing any congenital defect of structure, the increase of its capacity must be admitted: it is this circumstance which causes it to extend over the abdominal ring, as happens after repeated retentions of urine. According to Thibaut, the bladder has been known to enlarge so much as to hold nine pints.*

The bladder, while thus enormously distended with its contents, obviously cannot protrude at the abdominal ring, or crural arch, since the smallness of these openings makes it impossible; but, as already observed, it is then that the organ acquires a disposition to protrude as soon as it becomes empty. Its parietes, being distended beyond their natural limits, gradually lose their contractile power, or only retain this faculty in a slight degree, and the fundus can no longer be properly drawn down to the cervix, as in the state of health. Another truth, also represented by Verdier, and fully confirmed by experience, is, that such loss of tone will not fail to supervene, if the retentions of urine be frequent, and afflict persons of advanced age, or delicate constitutions.†

In the advanced stages of pregnancy, the urinary bladder in its distended state is compressed between the gravid uterus and the os pubis, the consequence of which is, that it undergoes an alteration in shape, becoming flattened, and at the same time broader, and expanded, as it were, towards each side. Hence, a part of it approaches much nearer than usual to the abdominal ring and Poupart's ligament; a circumstance fully explaining, why cystoceles are sometimes seen in women who are either actually pregnant, or have had children, and not in other females. It must be acknowledged, however, that in particular instances, the causes of the complaint are obscure; for it has been occasionally remarked in individuals who had been in a state of pregnancy, and never suffered a

* Mery in *Mém. de l'Acad. des Sciences*, 1713.

† See *Mém. de l'Acad. de Chirurgie*, t. iv. p. 69. 12mo.

retention of urine *; while many obstinate cases of the latter affection, combined with repeated pregnancy, have not constantly had the effect of producing cystocele. †

With those conditions of the bladder, which predispose to cystocele, and which are to be regarded as so many particular causes of the disorder, we must join the general causes of herniæ, which, as is well known, usually consist of violent efforts, such as take place in fits of coughing, sneezing, straining at stool, parturition, &c. During such exertions, all the parts contained in the abdomen are compressed by the action of the diaphragm and abdominal muscles, and there is then no difficulty in comprehending, how the parts which are situated nearest the canal of the ring will be likely to protrude, if this passage be at all capable of receiving them. Thus, the bladder, which we are to suppose very ample, with its coats flaccid and much thinner than natural, being near the ring and compressed by the neighbouring parts, will not fail to enter it, as often happens with respect to the intestines and omentum; with this difference, that the bladder, on account of its particular situation out of the peritonæum, draws after it the portion of this membranous bag, which covers the rings internally, whereas the intestines and omentum, in passing out of these openings, propels the peritonæum before ‡ them. In most instances, the spermatic cord lies behind the protruded part of the bladder; but, in one example upon record, it was found on the external side of the swelling. §

In the account given of bubonocoele in the chapter with which the first volume of this work concluded, I took care to explain the division of inguinal herniæ into those which take place on the outer side of the epigastric artery, called external, and into other cases, termed ventro-inguinal, where the protrusion does not follow the course of the spermatic cord from the point where it passes under the transversalis muscle, but passes directly from the cavity of the belly to the external abdominal ring through the aponeurosis of the internal oblique and transverse muscles, leaving the epigastric artery at the outer side of the neck of the hernial sac. Now as the kind

* Petit records a case, in which there were no circumstances of this nature to account for the origin of the disease, the cause of which was perfectly obscure. See *Traité des Maladies Chirurg.* tom. ii. p. 420.

† Richter's *Anfangsgr.* b. vi. p. 31.

‡ Verdier, *Mém. de l'Acad. de Chir.* t. iv. p. 71.

§ See Keates' *Cases of Hydrocele, &c.* to which is subjoined a singular case of *Hernia Vesicæ Urinariæ*, Lond. 1778.

of opening through which this *internal* bubonocoe forms, appears a more likely place for the occurrence of cystocele, than the more remote point at which the inguinal canal begins, a suspicion has been entertained, that herniæ of the bladder may sometimes follow the same track as the internal, or ventro-inguinal bubonocoe. At present, however, this idea remains unconfirmed by facts, and notwithstanding our inability to explain, why the bladder should deviate so far from the median line as to reach the commencement of the inguinal canal, experience teaches us that the cysto-bubonocoe is usually external.* One modern surgeon of eminence expresses great doubts of the accuracy of the description usually given, of the mode in which an inguinal cystocele is produced, and especially of the manner in which the protruded bladder is said to draw down consecutively the production of peritonæum, forming a pouch for the reception of the other viscera. This gentleman is inclined to believe what our countryman Sharp once supposed, but lived long enough to change his mind about †, that the intestinal hernia always precedes the cystocele. If this were true, (which experience contradicts,) it is conceived, there would then be no difficulty in explaining why protrusions of the bladder should happen, as they are found to do, through the inguinal canal, and not directly from the cavity of the belly out of the ring, in the manner of internal bubonocoe of Hesselbach. ‡

With respect also to those inguinal ruptures in which the cystocele is secondary, it is observed, that the relative positions of the opening and the bladder, render the occurrence of cystocele more probable as the consequence of the ventro-inguinal rupture, though it is a point which has not yet been determined by actual observation. §

When a cystocele is not immediately reduced after its first occurrence, which is perhaps never the case, the protruded bladder undergoes several changes. As it soon becomes adherent to the parts with which it is in contact in the groin and scrotum, the reduction of the hernia, except while perfectly recent, must be entirely impracticable. The portion of the bladder contained in the ring is always more or less compressed, and hence it is gradually rendered narrower, acquiring the form of a contracted neck, which intervenes between the expanded part of the bladder situated in the pelvis and

* Dict. des Sciences Medicales, t. vii. p. 668. also p. 679.

† Critical Enquiry into the present State of Surgery.

‡ Delpech, op. et vol. cit. p. 680.

§ Lawrence on Ruptures, p. 506. edit. 3.

the scrotum. The portion lying in the scrotum is repeatedly exposed to considerable distentions, in consequence of the urine being prevented from returning freely through the narrow compressed part of the bladder at the ring. This is particularly liable to happen, when the patient neglects to press the urine out of the pouch in the groin and scrotum, as often as an accumulation takes place. The result is, that such part of the bladder being often forcibly distended for a long time together, at length totally loses all power of contraction. Finally, the repeated collection and lodgment of the urine in the protruded bladder, frequently give rise to the formation of cakuli in it; and whoever peruses the many histories of cystocele now upon record, will have occasion to be particularly struck with the great frequency of this complication.

The duty of the surgeon in the treatment of an inguinal cystocele must vary according to the circumstances of the case. When the disease is not in a perfectly recent state, it neither can, nor ought to be reduced: it ought not, because the bladder has lost its natural shape, that is to say, the part of it situated in the ring is contracted and indurated, while the protruded part is expanded and deprived of its natural contractile power. Besides, such a hernia, partly on account of the preternatural shape of the bladder, and partly on account of the adhesions, does not admit of reduction.

These adhesions form in so early a stage of the complaint, that much doubt may be entertained respecting the possibility of reducing even a recent cystocele. As, however, the thing is asserted by some very experienced surgical writers, it is not for me to dispute the fact. Thus, Richter says, cystoceles, which are quite recent, may be reduced, but as they are not included in a sac, the reduction can seldom be effected all at once, but only by degrees, and in the following manner. The patient is to lie constantly upon his back, wear a suspensory bandage, and take care to hinder all accumulation of urine in the hernia by the uninterrupted employment of a flexible catheter. In this way, three means combine in promoting the reduction: the suspensory bandage gradually presses the tumour towards the ring, and prevents it from becoming distended with urine; the horizontal posture facilitates the reduction; and the catheter hinders the urine from getting into the hernia. If, says Richter, after the patient has continued this plan some time, he finds, when he holds his water, not the least swelling about the ring, he may conclude that the hernia is entirely reduced, and begin to wear a truss. *

* Anfangsgr. der Wundarzneykunst, b. vi. p. 38.

Sometimes the patient has at the same time an enterocele, which, if reducible, will not interfere with the foregoing plan; but when it is irreducible, and complicated with adhesions, a suspensory bandage is the only means to which the patient can have recourse. When a calculus is known to be contained in the protruded bladder, no attempt at reduction should ever be made, however recent the hernia may be: for, were the thing to be accomplished, the patient would be in a worse state than he was previously, being now subjected to all the grievances of a stone, and perhaps compelled to undergo the dangerous operation of lithotomy. The calculus, however, may be safely and easily extracted from the scrotum. A puncture should be made with a lancet into the lower part of the cystocele, while it is filled with urine; the opening is to be enlarged according to the size of the calculus, and the finger introduced, with which, or a pair of small forceps, the stone is to be taken out. This operation is free from difficulty and danger. Two circumstances, however, deserve notice: if the patient should have at the same time an intestinal hernia, this must be carefully reduced previously to the operation; but, if it should not be reducible, the surgeon must recollect, that the cystocele lies between the intestinal rupture and the spermatic cord, and of course he should introduce his lancet at the side of the swelling, where he plainly distinguishes the fluctuation of the urine. A catheter is then to be passed and kept in the urethra, in order to prevent the urine from getting into the protruded part of the bladder, and rendering the wound fistulous.

Sometimes the calculus is firmly lodged in that portion of the bladder which is immediately within the abdominal ring, producing pain, retention of urine in the hernial part of the bladder, fever, nausea, and other unpleasant symptoms. This accident may be brought on by the patient inadvertently pushing back the calculus into the ring, while he is squeezing the urine back from the tumour into the bladder. In this circumstance, when the calculus cannot be got out of the ring again by gently rubbing the part under which it lies, Richter recommends making an opening into the cystocele, in the vicinity of the ring, and taking the stone out with the finger, or a pair of forceps. Should the patient, however, happen to have an intestinal hernia, perhaps the operation might be avoided, as the reduction of the bowel would probably loosen the calculus, and enable the surgeon to dislodge it. *

* Richter, *op. et vol. cit.* p: 40.

According to Richter, a cystocele may become truly strangulated, that is to say, it may suffer such constriction at the ring as may produce pain, inflammation, confinement of the urine in the protruded bladder, and other disagreeable effects. The case varies according as it happens to be conjoined with an intestinal hernia, or not. In the first circumstance, the common rupture is often the cause of the strangulation of the bladder, and is itself at the same time strangulated. Here there is obviously only one indication, viz. to reduce or liberate the intestinal rupture by the usual means. In cases where the cystocele supervenes to an ordinary hernia, the collection of urine in the protruded part of the bladder may give rise to bad symptoms, as we find clearly evinced in the following instance. A clergyman had been afflicted with a bubonocoele five years, when being obliged to rise out of bed to make water while his truss was off, he was instantly seized with most acute pain at the ring, the hernia increased in size, and inclination to vomiting and hiccough followed. The symptoms continuing to augment, and the retention of urine coming on again, the patient was bled, and an attempt made in vain to return the parts. As no urine was voided for four-and-twenty hours, and the sufferings were great, a catheter was introduced: two pints of urine were thus drawn off, and the swelling underwent a considerable diminution. Though this circumstance created some suspicion of the bladder contributing to the tumour, the surgeon was not entirely clear about it, his doubt being kept up by the continuance of the general indisposition. At length, however, he acquired a certainty of the nature of the disease; for, on raising and compressing the scrotum, more urine was discharged, and the bad symptoms ceased.

In this case, the acute pain, and disturbance of the stomach, were observed always to recur, when the urine collected in large quantity in the hernia. The patient was advised to prevent any large accumulation by compression, and, as the hernia was not reducible, to wear a simple suspensory bandage, in preference to any truss, which made greater pressure. The case is also instructive in another point of view, as proving the necessity of never discontinuing the application of a truss in examples of bubonocoele, lest they become complicated with a protrusion of the bladder, and a train of dangerous symptoms resulting from the distention of that part of the cystocele which occupies the ring.*

* See Mém. de l'Acad. de Chirurgie, t. iv. p. 36, 37. 12mo.

In a complicated cysto-bubonocoele of the latter description, much benefit may be expected from the catheter; but where the protrusion of the bowels is secondary, and occasions such pressure on the neck of the cystocele, as is followed not only by the strangulation of the intestinal rupture, but by a hazardous degree of constriction of that part of the bladder which is in the ring, it sometimes happens, that, before the strangulation of the intestine can be removed, the collection of urine in the cystocele being exceedingly copious may cause serious danger, and demand particular assistance. Here, after the catheter has been passed, if the urine cannot be gradually pressed back through the ring, the surgeon should have no hesitation in puncturing the protruded part of the bladder with a small trocar, and letting out the urine; a proceeding, which M. Morand once adopted with success.

When the strangulation of the intestine resists milder means, the operation must be performed. It is to be done in the usual way; but care must be taken to avoid injuring the posterior and internal part of the hernial sac, immediately behind which the protruded bladder is situated. When the stricture has been removed, and the bowel returned, the bladder alone remains out of the ring, and since its continuance in the scrotum hinders a truss from being worn, without which the patient is in constant danger of a fresh descent of the bowel, its reduction would no doubt be a very desirable thing. Richter says, if the cystocele be recent, and only slightly adherent to the scrotum, the probability is, that it will gradually return of itself during the treatment subsequent to the operation, the patient being kept continually upon his back, and all distention of the bladder prevented by the uninterrupted use of a flexible catheter. Should the cystocele be of long standing, firmly adherent, and the bladder quite altered in shape, as above described, then no thoughts of reduction can be entertained.* As I have not read of any case, in which a cystocele, complicated with a strangulated hernia, has been successfully reduced in the operation done for the liberation of the other bowels, I infer, that the opportunity and possibility of completing such an object must, if they ever occur at all, be extremely rare. If, after the intestine, or omentum, has been freed from stricture, and reduced into the cavity of the abdomen, it be found that the reduction of the protruded part of the bladder is decidedly impracticable, and wrong to be attempted, it may be enquired, is

* Anfangsgr. der Wundarzn. b. vi. p. 41.

there any other step, which can be taken with a view of removing the risk, to which the continuance of such a protrusion must subject the patient, by interfering with the use of a truss? In this circumstance, several surgeons incline to the opinion, that the protruded portion of the bladder might be safely cut away close to the abdominal ring, the wound healed, and a proper truss applied. The idea appears to be founded on an operation of this kind, which Mr. Pott performed by mistake, the disease not having been known at first to be a cystocele. The patient, who was a boy, was superficially dressed, and had not a single bad symptom, though a portion of the bladder was totally removed: his urine came through the wound in his groin for about a fortnight; but as the parts healed, it resumed its natural course, and the patient afterwards remained free from complaint, except that the natural size of his bladder being lessened by the extirpation of a part, he was obliged to discharge his urine rather more * frequently. Richter, in noticing this practice, seems not to disapprove of it, provided the hernial portion of the bladder be inconsiderable, and the part situated at the ring very much contracted and indurated; but when the protrusion is larger, he condemns its excision on account of the annoyance which the patient would afterwards suffer in being obliged to void his urine with great frequency. Upon the whole, the operation may be said to be rejected by the best modern surgeons. As one late writer remarks, we should be careful not to let a few successful cases turn confidence into temerity. No doubt, wounds of the bladder are not invariably mortal; but they are dangerous. We certainly see lithotomy daily performed with success; and calculi may sometimes be safely extracted from a cystocele. But how can a simple incision, practised at the lowest part of such a swelling, be compared to the excision of the whole protrusion? By cutting so very near the ring as circumstances might require, we should also expose the patient to the serious danger, which may proceed from the urine getting into contact with the bag of the peritonæum. †

Were a surgeon, however, to determine to make the experiment, encouraged by the result of Mr. Pott's case, a catheter should be introduced into the urethra, in order to hinder the urine from being discharged at the groin, and thus retarding the cure of the wound.

When a cystocele exists alone, without any intestinal

* See Pott's *Chirurgical Works*, vol. ii. p. 209. edit. 1808.

† *Dict. des Sciences Medicales*, t. vii. p. 687.

hernia, it may sometimes suffer a degree of strangulation, one of the chief inconveniencies of which is a retention of urine. Two forms of the latter complaint occur in cases of cystocele: one retention takes place in the protruded portion of the bladder, and originates immediately from the pressure of the abdominal ring on that part of the viscus which lies within it. In general, this kind of retention of urine may be obviated by gently compressing the hernia, and if it cannot be thus relieved, it may always be so by puncturing the cystocele with a small trocar. The other species of retention proceeds from the forcible elongation and displacement of the urethra, the usual consequences of a considerable part of the bladder protruding through the ring, that canal being drawn to one side. In this case, not only the hernial part of that organ is distended with urine, the pelvic portion is in the same state. Here, also external pressure sometimes avails; but when no relief can be thus obtained, the catheter must be used. As the urethra is commonly drawn very much in a lateral direction, a silver instrument sometimes will not pass at all, and seldom without a great deal of trouble: an elastic gum catheter is therefore preferable. But if by this means the urine cannot be voided, puncturing the cystocele is the only * resource. According to Richter, the bladder sometimes descends so far into the scrotum, that the two ureters enter the ring, and suffer compression in it: thus, the urine may be hindered from getting into the bladder, and the patient be in a dilemma requiring immediate assistance. Here, if the hernia cannot be partially reduced by means of the taxis, and that in a very prompt manner, so as to re-establish the natural channels for the urine from the kidneys, the surgeon should make an incision down to the ring, and dilate it sufficiently to let an incomplete reduction of the bladder be at all events attempted. †

In women, a hernia of the bladder at the abdominal ring is extremely rare; a circumstance at which we cannot be surprised, considering the small size of that opening in the female sex. One case, however, is recorded by M. Verdier, which was also remarkable on account of its being a double cystocele, or a protrusion of the bladder at each ring. ‡ When an inguinal cystocele takes place in a female patient, it is mostly during pregnancy, when the bladder undergoes an

* Richter, Anfangsgr. der Wundarzn. b. vi. p. 43.

† I apprehend, that the nature of such a case, were it to happen, could never be made out with sufficient certainty to justify the operation proposed by Richter.

‡ Mém. de l'Acad. de Chirurgie, t. iv. p. 41. edit. 12me.

alteration in its shape, in consequence of the compression which it suffers in its distended state between the uterus and the ossa pubis. Hence, it becomes depressed at its middle, but extended further, than usual, on each side, or rather towards each groin. In this state, if any great exertion be made, and the conformation of the ring be such as to admit of a protrusion of the bladder, the displacement is possible, though not common, and never first produced while the bladder is actually distended with urine, for reasons already suggested. There is every reason for supposing, that, in the production of either an inguinal, or a femoral cystocele in a female, an inclination of the uterus very much forward, and a bladder of large dimensions, must have a principal share.

In Verdier's Essay * an instance is also mentioned of a femoral cystocele; an occurrence which is particularly uncommon. The patient was a dropsical woman, forty years of age. The swelling was situated at the upper part of the front of the thigh, its size varying according as the urine had been long retained, or not. The suspicion of the nature of the disease was further confirmed by the obliquity of the meatus urinaris, remarked in using the catheter.

VAGINAL CYSTOCELE.

The bladder sometimes produces a hernia in the vagina, generally at the anterior side of this canal, but occasionally at its posterior part. † The swelling is attended with a distinct fluctuation, frequent desire to make water, pain shooting up to the kidneys, and other symptoms of cystocele. Sometimes, when a catheter is introduced, its beak can be plainly felt in the hernial tumour. This species of vesical protrusion may attain a considerable magnitude: it has been seen equalling in size a man's head, and sometimes the swelling projects out of the vulva. ‡ It rarely occurs in women who have not had children, and it is more disposed to happen during the first few days after delivery, especially on making any great exertion while the bladder is much distended with urine. In one person, who had never had any children, the disease came on in a fit of coughing. §

The treatment of this case is not materially different from that of vaginal herniæ in general. For a radical cure, Richter conceives, that the use of astringent injections, and repeatedly

* *Mém. de l'Acad. de Chirurgie*, t. iv. p. 40. edit. 12mo.

† *Chopart*, l. c. p. 320.

‡ *Le Blanc*, *Précis d'Operations*, t. ii. p. 368.

§ *Richter*, *Anfangsgr. der Wundarzn.* b. vi. p. 45.

emptying the bladder, so as to prevent all distention of it, would be the most useful means.

A species of vaginal cystocele may arise from a prolapsus uteri, as will be noticed in the chapter on Vaginal Herniæ.

PERINEAL CYSTOCELE.

The two examples of perineal cystocele mentioned by M. Verdier, were for a long while the only cases of this description upon record. The earliest instance was published by M. Mery*, and a later one by M. Curade†: in both, the displacement occurred in female patients about the fifth or sixth month of pregnancy. This kind of cystocele, like all other protrusions of the bladder, is attended with more or less difficulty of making water; but when the swelling is compressed, the urine issues from the meatus urinarius, and the tumour subsides. If, however, only slight compression be made, the urine is not always thus discharged, but an inclination to make water is excited. The swelling, which is soft, free from all acute pain, and attended with fluctuation, is merely covered by the integuments, which retain their natural colour. In the case, communicated to the French Academy of Surgery by M. Curade, the swelling became larger when the patient was in the erect posture, and when she held her water a long while. The hernia spontaneously disappeared after delivery; but towards the end of a succeeding pregnancy, recurred in an enlarged form, now occupying the whole perineum.

When we consider the situation of the bladder, the possibility of this species of hernia seems hardly conceivable. But the two patients above-mentioned were both of them pregnant, and no doubt the weight of the uterus had forced the bladder down into the smaller cavity of the pelvis, and made it extend itself downwards by the side of the vagina as far as the perineum. The probability of this explanation appears greater, when it is remembered, that the shape of the bladder in women is different from what it is in men, or even from what it is in females who have never had any children, representing a kind of little barrel, rounded at its end, and placed transversely. The same cause, and same disposition of the bladder, being absent in men, may account for the formation of this hernia in them being difficult and uncommon; nor has it ever been remarked in the male sex more

* Mém. de l'Acad. des Sciences, 1713.

† See Mém. de l'Acad. de Chir. t. iv. p. 44.

than once. The details of this interesting and singular case are contained in an essay by M. Pipelet.* The complaint began at the early age of seven years with an acute attack of pain in the perineum, apparently induced by a fall, in which the legs were very wide apart. This pain subsided some time afterwards, but on the patient attempting to leap over a wide ditch, it recurred in an aggravated degree. From this period, the patient was never free from an uneasiness, weight, and dull pain in the perineum. But the chief annoyance which he felt, was that of being able to discharge only a very little urine at a time, and of being obliged, in order to relieve himself, to apply his hand to the perineum. The urine was then voided more freely, especially if the trunk was inclined forwards. The swelling was about as large as an egg, oblong, and softish. When compressed between the fingers it yielded, and on its return into the pelvis, along the right side of the urethra, M. Pipelet could perceive a roundish dilatation, capable of holding a nut, under the raphe, about two finger-breadths from the anus. This surgeon conceived that, in the fall which the patient met with in early age, some of the fibres of the levatores ani and transversalis perinæi were ruptured; that thus the partition, which shuts up the bottom of the pelvis, was rendered imperfect; and that, in this state, the action of the abdominal muscles and diaphragm caused the inferior part of the bladder to protrude downwards, so as to produce a hernial tumour in the fat under the skin of the perineum. M. Pipelet invented for this case a particular sort of truss, or compress, with a concavity, or groove in it, securing the urethra from pressure. This case is remarkable, as being the only example on record of a perineal cystocele in a male subject.

CONGENITAL CYSTOCELE.

A congenital cystocele above the pubes has been † noticed. It was round, and of the size of a hen's egg. The bladder protruded at a fissure between the recti muscles. ‡

* *Nouvelles Observations sur les Hernies de la Vessie, et de l'Estomac*, in *Mém. de l'Acad. de Chirurgie*, tom. xi. p. 284. 12mo.

† Stoll, *Ratio Medendi*, t. iii. p. 429.

‡ In a few very uncommon instances, a protrusion of the bladder has happened through the foramen ovale, as will be explained in a succeeding chapter: a cystocele has also occurred at the great ischiatic fissure. See Schræger's *Chirurgische Versuche*, b. ii. p. 156, &c. 8vo. Nurnberg, 1818. Of this last case, a particular account will be given in a following chapter.

CHAP. V.

HERNIÆ OF THE VAGINA.*

AS is well known, the inferior portion of the peritonæum spreads itself over the fundi of the bladder and uterus, and the anterior surface of the rectum. Between the fundus of the uterus and the latter bowel, as well as between the bladder and uterus, there is a depression, arising from the separation of these viscera from each other. Into these excavations the peritonæum descends, forming, as it were, two wide open sacs. When a vaginal hernia originates, the bowels propel one of these sacs of the peritonæum downwards, and occasion a swelling at the anterior or posterior side of the vagina. As the depression betwixt the uterus and the rectum is more considerable, than that betwixt the uterus and the bladder, the bowels are more apt to glide down behind, than before the uterus; and hence, herniæ of the vagina more frequently occur at the posterior, than the anterior side of this canal.

The hernia, however, rarely makes its appearance precisely at the front, or back of the vagina, but usually inclines more or less to one side of it. According to Richter, the reason of this is as follows: not only the firm body of the uterus, but also the frequently distended bladder and rectum, present an obstacle to the bowels, as they pass downwards, which therefore incline more or less to one side, where they meet with a much looser cellular substance, than in mid-space between the above-mentioned viscera, which usually lie very close together. Some vaginal herniæ, however, are situated exactly at the anterior, or posterior side of the passage.†

The displaced bowel always separates the uterus and vagina either from the bladder, or the rectum; and when it reaches the vagina, it pushes outward the coats of this passage in the form of a tumour, situated within the same canal, or even projecting out between the labia, as happened in the case related by Garengot. The hernia may contain either intestine, omentum, or a portion of the bladder.

This hernia mostly occurs in women who have had many children. The distention of the uterus and vagina, during pregnancy and parturition, not only relaxes the cellular mem-

* These cases are not treated of by the ancients: the instance recorded by Garengot is the first upon record.

† Richter, *Anfangsgr. der Wundarzn.* b. vi. p. 1.—4.

brane connecting these organs to the rectum, and thus facilitates the protrusion of the viscera between them; but it also weakens the coats of the vagina itself, whereby the formation of the swelling in that passage is considerably promoted. Hence, during the first few days after delivery, a very slight cause will sometimes bring on a hernia in the vagina. In one woman, it was occasioned on the seventh day after delivery, by her attempting to carry a pail of water from one place to another. Vaginal herniæ, however, have been known also to happen in women who had never had any children, and, in one such example, the protrusion was induced as the patient was straining at stool.*

In some instances, herniæ of the vagina occur gradually; in others, their formation is quite sudden. Those cases are generally produced all at once, which are the consequence of a fall, a violent concussion of the body, or any great effort, or exertion.

The following are the symptoms of a vaginal hernia: the patient, under some of the circumstances, which are usually concerned in the production of ruptures, feels all on a sudden something fall down within the vagina, and at the same time experiences acute pain in the situation of the hernia. This pain gradually changes into such as is felt in colic, and it either continues unremittingly, or subsides and recurs at intervals. When the surgeon examines the vagina, a preternatural tumour is perceived in it, projecting from one side of the passage. When the swelling is compressed with the finger, it diminishes, or entirely disappears, but returns again as soon as the pressure is discontinued. It becomes harder, tenser, and larger, when the patient stands up, coughs, or holds her breath, and softer and smaller, when she lies down upon her back. The os uteri is entirely free, having no connection whatever with the tumour; a consideration, which completely removes all possibility of mistaking the disease either for a polypus, or an inversion of the uterus.

When the protrusion happens between the uterus and the rectum, the swelling presents itself at the posterior part of the vagina, very far down, near the os externum: when between the bladder and the uterus, the tumour is at the anterior surface of the vagina, and generally high up, towards the os uteri. In both cases, however, the hernia always inclines more or less to one side, or the other. In the latter form of the complaint, various affections of the urinary organs, and difficulty of

* Hoin, in *Précis d'Opérations de Chirurgie*, par M. Le Blanc, t. ii. p. 459.

voiding the urine, are usually produced ; these inconveniences are increased when the patient is in the erect posture, and diminished, or entirely removed, when she lies down. In consequence of the nearness of the os pubis, and the pressure which the prolapsed bowels suffer, the vaginal hernia, which takes place between the bladder and uterus, is attended with more frequent and severe colic-pains, than that which happens behind the uterus. It is sufficiently obvious, also, that the pain will be more violent when the patient is standing up, and the protrusion consequently greater, and that the suffering will decrease, when she is in the recumbent position, and the hernia therefore more or less reduced in size.

Although there is considerable difficulty in imagining how the omentum can descend into a vaginal hernia, experience proves the reality of the occurrence.* In the cases of this description on record, the hernia lies between the bladder and the vagina ; and, indeed, it is scarcely conceivable, how the omentum can ever get into the posterior vaginal hernia. The urinary bladder also sometimes protrudes in such tumours as occur at the anterior surface of the vagina. The swelling is then accompanied with an evident fluctuation, and always increases in size, when the patient holds her water for any time. This species of cystocele is invariably attended with a dilatation of all the coats of the vagina, in which respect it bears a considerable resemblance to a prolapsus of the vagina ; and it is observed, that a prolapsus of the anterior parietes of this passage cannot happen, without being followed by the urinary bladder. In one example †, such a cystocele was brought on during a convulsive cough. A retention of urine ensued, which required the frequent use of the catheter. When the swelling was pressed upon, a desire to make water was excited. Immediately the urine had been discharged, the swelling disappeared, and the upper part of the vagina became flaccid and relaxed.

Dr. Monro junior informs us, that his father met with a remarkable instance of a cystocele from a prolapsus uteri ; the vagina was inverted, and the mouth of the uterus formed the under part of the tumour, while the urethra described a curve on the fore-part of the swelling. The urine had been suppressed for several days, when the catheter was passed, and five pints of urine drawn off. ‡

* Le Blanc, *Précis d'Operations*, t. ii. p. 321.

† Sandifort, *Observ. Anat. Pathol. lib. i. ii.*

‡ Monro on the *Morbid Anatomy of the Human Gullet, Stomach, and Intestines*, p. 522. 8vo. Edinb. 1811.

A vaginal hernia somewhat resembles a prolapsus of this canal, and in reality it is always conjoined with at least a prolapsus of its inner membrane; nor would a mistake generally lead to serious harm, as the treatment of both swellings is for the most part alike, and a pessary as necessary for one as the other. It is useful, however, to be able to discriminate these tumours, for, in the case of a hernia, if the surgeon were to apply a pessary before he had carefully reduced the viscera, he might occasion symptoms of strangulation. The distinction is easy: the hernia commonly takes place suddenly; the prolapsus, by degrees. The first is attended with various complaints of the intestinal canal, particularly with frequent attacks of colic-pains; the second is exempt from them; not to say any thing of the other general symptoms of a rupture.*

When the hernia is large, descending behind the uterus far down, to the lowest part of the vagina, it causes such a separation of the rectum from the uterus, that the latter intestine is no longer adequately supported, and falls out at the anus.† The ileum is mostly contained in a vaginal hernia; but sometimes the cœcum and colon have been found within such a protrusion. The retroversio uteri, as Richter observes, may be considered as another species of vaginal rupture.

The principal indications in the treatment of a vaginal rupture are to reduce the displaced bowels, and hinder their protrusion again. The reduction is generally free from all difficulty, requiring nothing more, on the part of the surgeon, than moderate pressure with the finger; and, on the part of the patient, a horizontal posture. When the hernia has taken place between the bladder and uterus, the patient should lie upon her back during the attempts at reduction, because, in this position, the uterus inclines towards the rectum, and the aim of the surgeon is facilitated. In the opposite case, where the hernia lies between the rectum and the uterus, the patient should support herself upon her elbows and knees, in which posture the reduction will be less difficult. In both cases, the chest should be low, and the pelvis elevated. These directions, says Richter, refer chiefly to difficult cases; for, in common instances, the hernia may be easily reduced in any position.

The second indication, or that of preventing a return of

* When Garengéot was consulted by the woman whose case forms the earliest example of this disease, he at first supposed it to be a prolapsus uteri; but, noticing that the os uteri was not displaced, he was immediately undeceived.

† Haen, *Ratio Medendi*. cap. i. p. 7.

the hernia, is attended with greater difficulty. It is best fulfilled by means of a well-made pessary, which should completely distend the vagina at every part. As, however, a cylindrical pessary, composed of hard substances, cannot be worn without great pain and annoyance, trials have been made of such instruments, made of elastic gum; but they are found not to afford for these particular cases adequate resistance. Hence Richter recommends a pessary made by surrounding a cylinder of wood with a sufficient quantity of linen to make it of due thickness. Each covering of linen is to be firmly tied on with strong thread, the circles of which are to lie close together from one end of the instrument to the other. When finished, it is to be coated with a solution of gum lac, to hinder it from being damaged by the secretions of the parts. Another contrivance, of which the same author speaks favourably, is a large cylindrical piece of sponge, covered with waxed taffeta, in order to hinder it from imbibing and lodging the secretions of the parts until they become acrid and irritating.*

A common oval pessary is insecure, and indeed of no use; for, as it merely touches the vagina with its thin edge, it not only does not apply itself effectually to the situation of the hernia, but, upon the slightest change occurring in its position, it slips entirely away from the point which it ought to compress. In women who have had children, it is generally necessary to employ a T bandage for keeping the pessary from slipping out.

Notwithstanding the employment of a cylindrical pessary, the hernia will sometimes fall down again, when the patient coughs, strains, or makes any great effort. The protrusion is particularly disposed to recur at the posterior surface of the vagina, between it and the pessary, because here the rectum easily yields and makes room for the displaced bowels. There is less danger of the parts protruding again, when the hernia has been at the anterior surface of the vagina, as here the ossa pubis make a degree of resistance. The patient should avoid every thing at all likely to bring on another protrusion; and as soon as she perceives that a fresh displacement has happened, she should lie down upon her back, withdraw the pessary, and after returning the hernia, apply the instrument again. The recurrence of a protrusion is generally discovered in a short time, as severe colic-pains are immediately excited by it.

* Sabatier, who thinks sponge not an eligible substance, recommends a bag, filled with astringent vegetable substances cut into very small pieces, or else a spiral wire spring covered with cotton quilting. See *Médecine Opératoire*, t. ii. p. 427 Paris, 1810.

Sometimes, by means of the uninterrupted use of a pessary, the patient is fortunate enough to obtain a radical cure, especially if she has taken care regularly to employ, in conjunction with that instrument, astringent injections. The result, however, is not always favourable. When the protrusion happens between the bladder and uterus, the passage, through which the parts descend from the cavity of the abdomen to the place where they project into the vagina, is observed to be short, the protrusion in this case generally occurring at the upper part of the vagina, near the os uteri, and not low down, where the ossa pubis oppose the displacement. On the contrary, when the hernia has taken place between the rectum and the uterus, the passage is generally long, the tumour usually presenting itself low down in the vagina. In this example, therefore, the complete reduction of the bowels into the abdomen is more difficult, and a radical cure less to be expected.

From the preceding remarks, it must be obvious, that, in order to reduce a vaginal hernia properly, it is not enough merely to compress the tumour in the vagina until it subsides, but, that, after its disappearance, the whole posterior surface of that canal, when the hernia is situated behind, must be pressed upon and rubbed with the finger up to the os uteri, so as to reduce the bowels completely out of what Professor Richter terms the neck of the hernia. While the surgeon is accomplishing this object, the patient is to remain in the posture above recommended; and, though the hernia may present itself near the entrance of the vagina, the cylindrical pessary, as Richter observes, must always be sufficiently long to reach up to the os uteri, whereby the passage, through which the bowels protrude, may be closed its whole length as completely as possible. Hence, such pessaries as are not of a cylindrical shape, and not calculated for entirely filling the vagina, must be ineffectual.

Experience has proved, that a vaginal hernia may become strangulated; yet it is an accident which seldom happens. The parts between which the bowels protrude into the vagina are so soft and yielding, that they can hardly be the cause of strangulation.* Also, when the viscera are thrust through the muscular coat of the vagina, its fibres are too weak and slender to be at all likely to make any

* "Il n'arrive jamais d'étranglement en vertu de la constriction de l'ouverture, par laquelle les parties se sont échappées." Sabatier, Médecine Opératoire, t. ii. p. 428.

dangerous constriction on them. But in this, as well as in other ruptures, some point of the neck of the hernial sac may become contracted and indurated, and thus produce strangulation. A still more common cause of the bad symptoms depends upon an accumulation of the feces; and, in every example of this kind, where any of the complaints usually attending a strangulated hernia exist, it is a matter of the highest importance to empty the bladder and rectum without delay, so that the distention of these organs may create no impediment to the prompt reduction of the hernia. Emollient oily clysters must be particularly useful, when it is a posterior vaginal hernia that is strangulated. While the attempts at reduction are making, the patient is to be placed in the posture above recommended.

The uterus is frequently the cause of the strangulation, especially during pregnancy; and in this way, the anterior vaginal hernia is more frequently and violently strangulated, than the other form of the disease. Although it appears almost impossible for any of the bowels to protrude between the uterus and bladder in pregnancy, yet the accident sometimes really occurs*; or, at all events, anterior vaginal herniæ have been observed. In a case of this kind, the reduction would be easy, when the patient is put in the right posture, with the pelvis raised, and the thorax low.

The most urgent danger is sometimes produced by such a hernia at the time of delivery. When the bowels protrude at this period, the pressure of the child's head upon them may cause very severe pain, delivery may be obstructed, and convulsions induced. Here the hernia should be reduced as quickly as possible, before the child's head has passed down so far as to render it impossible. But, as a fresh protrusion generally happens on the return of every labour-pain, the accident must then be prevented by making pressure with the fingers against the point where the hernia is disposed to occur; and this plan must be followed up, until the child's head has descended so far as to conceal the place of the hernia, and itself hinder another protrusion. Were the head to have passed down so far as to conceal the hernia, which had not been reduced in proper time, Richter thinks, that either an attempt should be made to push the head a little way back, in order to be enabled to reduce the bowels, or that the delivery should be expedited by means of the forceps.†

* Hoin; see *Précis d'Operations* par Le Blanc, t. ii.

† Anfangsgr. b. vi. p. 20.

During the first few days after delivery, while the uterus is distended with blood, enlarged, and heavy, it may also produce a species of strangulation that is exceedingly severe, when the patient is in the erect posture; but gradually subsides, as the uterus returns to its natural size. M. Hoin has likewise related an instance, in which the symptom of strangulation appeared to depend upon an obstruction of the menses, and the consequently increased weight and dimensions of the uterus, as the complaints went off when the menstrual evacuation was established.

The records of surgery at present furnish us with no instance of an operation being done for the relief of a strangulated vaginal hernia. Supposing a case were to happen, which could not be relieved by any of the usual means, would it be right and prudent to have recourse to the knife? If the hernia were situated low down in the passage, Richter conceives that there would be no great difficulty in making an incision through its coverings; but that a dilatation of the neck of the hernia could only be safely attempted with the finger, or some other suitable instrument. When the protrusion is situated so high up in the passage that it cannot be opened in the usual way, I think no surgeon of common sense, or prudence, would attempt any thing with the knife, either in the vagina, or above the pubes*, as was once suggested by M. Hoin.

Fortunately, as M. Sabatier remarks, the circumstances under which it is conceived, that these operations ought to be practised will perhaps never happen, and consequently no one will have an opportunity of trying such experiments. †

When the fundus uteri falls down through the os tincæ into the vagina, the inversion always produces a sac, into which the viscera may enter. Here a very peculiar sort of hernia, named *enterocele hysterica*, is occasioned, in which the hernial sac is composed of the uterus itself. According to Professor Richter, the contraction of the os tincæ may, in such a case, give rise to a strangulation of the viscera; an evil, which might be easily removed by dilating the os uteri with the finger. ‡

* If the bowel were between the rectum and vagina, the proceeding here alluded to would be absurd, and only hasten the patient's death.

† De la Médecine Opératoire, t. ii. p. 450.

‡ See Richter's Anfangsgr. b. vi. kap. 1.

CHAPTER VI.

PERINEAL HERNIA.

IN a male subject, the protrusion happens between the rectum and urinary bladder; in women, between the rectum and vagina: the displaced viscera pass downwards, make their way through the fibres of the levator ani, and present themselves in the form of a swelling, situated in the perinæum, near the anus, and generally on one side or the other of the raphe. Sometimes the hernia does not make its appearance externally; that is to say, the bowel protrudes downward, but not far enough to push out the integuments in the shape of a tumour. On the contrary, it remains under the skin of the perinæum, and the patient has a rupture, without being conscious of it.* This hidden sort of hernia may be the unsuspected cause of various complaints, as, for instance, repeated attacks of colic, obstinate constipation, different disorders of the urinary organs, &c. With a little attention, however, the nature of the case admits of being detected. Thus, when a patient complains of feeling in the situation of this incomplete perineal rupture, (in men, about the neck of the bladder; in women, between the vagina and rectum,) a frequent extraordinary sensation of weight, dragging, and tension; when this sensation was first excited upon some of those occasions, which are known often to give rise to hernia; when repeated attacks of colic occur, commencing at the bottom of the pelvis, and afterwards extending over the whole abdomen; and when all these complaints are increased by the patient's continuing long in a standing posture; there is strong reason for suspecting the existence of a concealed perineal hernia. The surgeon may ascertain the truth of the conjecture by a manual examination in the vagina, or the rectum.

It seems almost impossible for a perineal hernia to take place in women. One would expect, that, as the displaced viscera pass down between the vagina and rectum, they must always be more apt to protrude into the vagina, than the perinæum; and that as soon as they have formed a vaginal swelling, they can have no further tendency to occasion a tumour in the perinæum. Such was the opinion of Desault

* In Bromfield's *Chirurgical Observations*, vol. ii. p. 264., may be read the account of a case, in which a perineal hernia presented itself in the middle of the operation of lithotomy.

and Chopart. Perineal herniæ, however, have really happened in females. It may be supposed, that such protrusions can only take place in unmarried women, whose vaginæ being in an unrelaxed state is capable of resisting a protrusion, and that consequently the bowels pass completely down into the perinæum; but this opinion is also contradicted by experience. Perineal herniæ have been observed not only in women who have already borne children*, but likewise in such as were in the state of pregnancy.†

M. Hoin‡ ventures to conclude, that the two cases related by Smellie were nothing more than vaginal herniæ, because their reduction was effected from that passage; but, as Schreger§ remarks, if these examples had not been perineal ruptures, are we to suppose, that Smellie would have described their precise situation? Can it be imagined, that this most respectable writer would have represented the swelling, in one case, as situated on the left side of the anus, and, in the other, actually on one side of the perinæum?

Probably, says Richter, in women a perineal hernia is generally accompanied with a protrusion of the viscera into the vagina; for, it is scarcely to be imagined, that a bowel can lie between that canal and the rectum, without occasioning a swelling at the posterior part of the vagina.||

Camper had an idea, that a perineal hernia in a male subject could hardly take place, owing to the smallness of the pelvis (*ob pelvis compressionem*;) but experience proves the contrary, various instances of this disease in men being recorded by Pipelet, Bromfield, Chardenon, and Schneider.

The contents of a perineal hernia may be intestine, omentum, or a portion of the urinary bladder. The case, however, is mostly an enterocele. It appears almost impossible for the omentum to fall down into the perinæum betwixt the bladder and rectum. But, protrusions of the bladder in this direction have been remarked both in male¶ and female** subjects.

Besides the general causes of ruptures, all considerable and frequent distentions of the rectum must materially promote the formation of these herniæ. The same circumstances

* See the relation of a decided instance of perineal hernia in Schreger's *Chirurgische Versuche*, b. ii. p. 181. &c. Nurnberg, 1818.

† See Smellie's *Observations of Midwifery*, vol. ii.

‡ See Le Blanc, *Précis d'Operations de Chirurgie*, t. ii. 8vo. 1775.

§ *Chirurgische Versuche*, b. ii. p. 181.

|| *Anfangsgr. der Wundarzn.* b. vi. p. 25.

¶ Pipelet, *Mém de l'Acad. de Chir.* t. xi. 12mo.

** Cürade, *Mercur de France*, 1762.

which appear to induce vaginal, may also bring on perineal ruptures. On the whole, as a modern author remarks, these last cases must be unfrequent, both because all the circumstances which contribute to their origin are rarely found together in the same individual, and a material peculiarity in the pelvis, a peculiarity that is said to have a chief share in facilitating the occurrence, seldom exists. Le Blanc believed, that a perineal hernia could never happen, without a considerable propulsion of the viscera downwards, great resistance of the abdominal parietes, and of all the apertures*, at which the bowels more commonly protrude, and an extraordinary relaxation of the fold of the peritonæum between the rectum and vagina, or bladder, and of the ligaments of the ischium, closing the inferior opening of the pelvis. But, says Schreger, however true this statement may be, the explanation of the causes of perineal ruptures is yet left imperfect; and this deficiency he endeavours to remove by calling the attention of practitioners to an anatomical fact, with respect to the pelvis in a patient afflicted with such a protrusion; viz. that the inclination of the pelvis is not natural, but more backward than it ought to be, whereby its upper opening is not placed forward enough, and its axis forms too acute an angle with the trunk. Hence, the viscera rest but little on the parietes of the abdomen, and fore-part of the pelvis, but press perpendicularly down to its bottom. If, together with this form of the pelvis, its inferior aperture should also be very large, the occurrence of a perineal hernia would be still more possible.† Perineal herniæ generally come on slowly and by degrees; for, it is impossible that an intestine should suddenly descend all at once from the cavity of the abdomen to the perinæum. Were such a hernia suddenly to protrude externally, there would be reason to suspect, that the viscera had for some time previously descended a part of the distance.

The swelling arising from a perineal hernia generally occurs on one side of, and seldom exactly under, the raphe: this is probably owing to the circumstance of the hernia rarely passing down precisely in the central line between the bladder and rectum, but rather towards one side of these viscera, their frequent distention producing an impediment to the descent of

* Juville, however, saw in one individual an exomphalos, a crural hernia, and rupture in the labium. See *Traité des Bandages*.

† See Schreger's *Chirurgische Versuche*, b. ii. p. 183, 184.

the displaced bowels in a middle line. The tumour also presents all the usual characters of a hernia; becoming larger and tenser when the patient stands up, or holds his breath; smaller, and softer, and even imperceptible, when he lies down, &c. With respect to perineal cystoceles, they have already been considered in a foregoing chapter. In men, a perineal enterocele must unavoidably produce various complaints of the urinary organs, as it always presses and irritates the neck of the bladder. In women, it constantly occasions a tumour at the back of the vagina.

Although, in the ordinary posture, the size of the swelling may be lessened by means of pressure with the hand, the reduction of the hernia is not truly effected: the viscera still continuing within the hernial passage between the rectum and the bladder. In order to make the reduction complete, the surgeon should not only compress the swelling externally, but, at the same time, pass his finger into the vagina, or rectum, and thus assist in pushing the displaced bowels further up into the abdomen.* For the prevention of a return of the protrusion, a compress and T bandage are commonly recommended; but, as Richter remarks, they can afford but very little effectual assistance. They can only hinder the formation of an external swelling in the perineum, and do not make any resistance to the occurrence of the protrusion between the rectum and the bladder, or the vagina. The bowels may still pass down as far as the integuments, and form a swelling immediately the bandage is taken off. Richter conceives, that a cylindrical pessary, with a T bandage, as advised for the vaginal hernia, would prove much more useful, as it would press the posterior side of the vagina against the rectum, close nearly the whole extent of the passage by which the bowels have descended, retain these viscera in the cavity of the belly, and be the means not only of a palliative, but perhaps also of a radical cure. Richter thinks it probable, that in male patients, the plan of keeping the rectum distended with a similar mechanical contrivance might be equally useful.

A perineal hernia may become strangulated, especially during pregnancy or labour. Smellie informs us, that a woman had a perineal hernia on the left side of the anus. Labour-pains came on while the bowels were down, which consequently became painful and strangulated. After delivery, considerable hemorrhage took place; an emollient poultice was ap-

* Smellie, l. c.

plied, and the hernia went up without any further ill effects. At the next labour, the hernia descended again; and, in order to prevent it from being strangulated again, the practitioner, while the patient was free from pains, and the membranes presented, introduced his hand into the vagina, and reduced the viscera, immediately after which the waters were discharged. In an instant, the head of the child passed down into the vagina, and prevented another protrusion. As Richter observes, this case fully exemplifies what ought to be the conduct of a surgeon under similar circumstances. In another woman, the hernia could not be reduced; the patient suffered excruciating pain; and the swelling had already assumed a livid colour. At length it burst, and about a spoonful of bloody matter was discharged. Immediately afterwards, the intestine returned into the abdomen. This woman soon recovered, with the exception of a small fistulous opening, from which a small quantity of fluid continually oozed. In the following pregnancy, the rupture protruded again several times, but was as often reduced.

The slowness and difficulty, with which the contents of the bowels pass through a perineal hernia, may also bring on complaints very similar to those of a true strangulation of the viscera. Here, besides the usual means, Richter recommends the administration of emollient clysters, with a view of relaxing the passage through which the bowels descend, and facilitating their reduction. And he particularly explains that in attempting to return the parts, it is not enough simply to make pressure on the swelling in the perinæum; but the bowels must also be pressed upwards at the same time by means of a finger introduced into the rectum or vagina. The occasional necessity for an operation is likewise generally admitted. No difficulty can here attend the making an opening into the hernial tumour: the passage, however, through which the bowels have descended, can only be dilated with the finger, or some other blunt instrument, as the use of a knife for this purpose would be altogether inadmissible.*

* Richter's *Anfangsgr.* b. vi. kap. 2.

CHAPTER VII.

HERNIA OF THE FORAMEN OVALE.

ALTHOUGH this opening is nearly closed by a ligament and the two obturator muscles, a notch is left at its upper and internal part, for the passage of a considerable artery, vein, and nerve. It is through this small aperture that the bowels sometimes protrude, so as to form the species of hernia, of which I am now about to treat. For the first account of this particular case, we are indebted to the eminent French surgeon Garegeot *, subsequently to whose time the disease has been observed by other practitioners. Garegeot has recorded no less than seven instances of it; and Heuermann met with another example of it in dissecting the body of a female subject. † Two other cases fell under the notice of Eschenbach ‡, and one is very particularly described by Cloquet. § The disease has been more frequently seen in women than men; but it has been occasionally remarked in both sexes, and one of the examples mentioned by Eschenbach took place in a young man scarcely more than twenty years of age. Vogel reports a very curious instance, in which there was a protrusion at both foramina ovalia. || In the case dissected by Heuermann, it was a piece of the ileum that formed the swelling. The omentum has also been found in herniæ of the foramen ovale; and Gunz even speaks of a cystocele which happened in the same situation. ¶ Experience has further proved, that this species of hernia is most disposed to take place in women soon after delivery: in one example, however, it succeeded a fall upon the buttocks.

In a hernia of the foramen ovale, the tumour occurs at the upper and internal part of the thigh, very near the scrotum in men, and the labium in women. In the case, which was examined by Heuermann, the hernial sac lay under the first and second heads of the triceps and the pectinalis muscles.

This kind of rupture is liable to strangulation: and the first case recited of this disease by Garegeot affords a proof of the observation. Were it in this state to be attended with

* Mém. de l'Acad. de Chirurgie, t. 1. p. 709. 4to.

† Chirurgische Operationen, 1 B. p. 578.

‡ Observata Anatom. Chirurg. Medica Rariora. Obs. 33. p. 265.

§ See Bulletin de la Faculté de Médecine, No. 8. pour 1812.

|| Von den Bruchen, p. 204.

¶ De Herniis, p. 96.

urgent symptoms, and to resist all attempts at reduction, though the most approved means were tried, and the patient kept constantly in the recumbent posture with the buttocks raised, it might become necessary to have recourse to an operation. As experience, however, has not yet furnished surgeons with any example of its performance, little can be said concerning it. The hernial sac might, perhaps, be opened without any considerable difficulty: but a division of the part of the obturator ligament forming the strangulation would be extremely hazardous, if not impracticable: the depth of the stricture from the surface is very considerable, but the danger chiefly depends upon the large vessels, which are close to it. Hence, both Richter and Sabatier are of opinion, that, if the operation were attempted, the stricture should not be cut, but be dilated with a suitable instrument. *

When a hernia of the foramen ovale has been reduced, the next thing is to endeavour to prevent another protrusion by the application of a compress and bandage. The compress, or pad, should be so constructed, as to close and fill up the hernial opening, which in general can be very plainly distinguished after the bowel is returned. As the aperture may be round, oval, or oblong, the shape of the pad must be determined accordingly. If we can credit reports, the use of such an apparatus may produce a radical cure; and, in one example related by Garengeot, this desirable object is stated to have been accomplished in a few weeks.

A very small portion of intestine may become pinched in the notch of the foramen ovale, and produce all the perilous consequences of a strangulated hernia, without any outward visible swelling, or the patient having the slightest suspicion of a hernia. The diagnosis and treatment of such a case would, of course, be obscure and perplexing. Perhaps, however, an intelligent surgeon might have his attention excited to the real nature of the disease, particularly if the bad symptoms appeared to be the immediate consequence of any of the causes by which herniæ in general are brought on, and there were any complaint made of pain about the foramen ovale itself. But, in a doubtful example of this description, if the taxis and the usual means failed to procure the return of the intestine, what prudent surgeon would expose his reputation by having recourse to the scalpel?

In concluding this chapter, it may be useful to admonish

* Sabatier, *Médecine Opératoire*, t. ii. p. 420. ed. 12mo. Richter, *Anfangsgr.* b. vi. p. 49.

surgeons to be very careful in examining all tumours which present themselves about the abdomen and pelvis, lest they mistake a hernia for an abscess. Such a blunder, indeed, has actually been made by a surgeon of reputation; Garengot speaks of the fact as follows: A sadler in the Rue du Sépulcre at Paris had a hernia of the foramen ovale; the surgeon who was consulted supposed it was an abscess, and directed poultices to be applied, in order to bring it forward. While he was examining their effect, and pressing the tumour with his fingers, to ascertain whether the fluctuation which he thought he had previously felt had become more distinct, the displaced bowel suddenly went up into the belly. Had not this happened, the patient would probably have fallen a sacrifice to the carelessness of a surgeon of well-known talents and eminence.

CHAPTER VIII.

HERNIA OF THE OVARY.

THIS case implies a swelling arising from a protrusion of the ovary at the abdominal ring. The disease, which is rather uncommon, was met with by Mr. Pott in a woman about three-and-twenty years of age: she had, in each groin, an irreducible, unequal, painful tumour, somewhat moveable, unattended with inflammation of the skin, and produced by a displacement of the ovaries. The nature of these swellings was not at first understood; they were supposed to be ordinary ruptures, and every means tried to effect their reduction. When the tumours were compressed in the different movements of the body, the patient experienced some degree of inconvenience; and she was therefore anxious to get rid of them. The skin and cellular membrane having been divided, a hernial sac, including the ovary, was exposed. A ligature was applied round the base of the protruded part, which was then removed with the knife. The same operation was next performed in the other groin. The patient afterwards enjoyed good health; but she grew thin, more robust, and muscular; while her breasts, which had been large, wasted away, and the menses entirely ceased.

Another example is recorded by Lassus, in which one of the ovaries, protruding at the abdominal ring, in a girl about

sixteen or eighteen years of age, was cut away after being tied as in the preceding instance.

This practice was adopted in consequence of the real character of the complaint not being understood. The patient recovered, and was afterwards seen by Mr. Lassus, who reports, that she did not exhibit any of the phenomena remarked in the instance detailed by Mr. Pott. *

It is asserted, that, in an adult patient, the inguinal tumour may be known to be a hernia of the ovary by introducing a finger into the vagina; for, the position of the uterus will be found to be oblique, and, if the os tincæ be touched, an evident impulse will be communicated to the swelling in the groin.

The ovarian hernia also occurs in very young subjects. In them, the ovary is naturally situated higher up and nearer the ring than in grown up women, while the pelvis is, at the same time, smaller and more shallow.

A little girl, says M. Lassus, about four or five years of age, had a painful circumscribed elastic tumour at the right abdominal ring. The integuments inflamed, and an abscess followed, which burst, and left the ovary visible on the outside of that opening. The protruded part was larger than it usually is at this early age, a change which had no doubt been occasioned by the constriction which it had suffered in its passage out of the abdomen. The ulcer was covered with simple dressings; the swelling abated; and, by means of gentle compression, kept up for about a fortnight, the tumour gradually disappeared, and the little patient got completely well. †

A hernia of the ovary should always be reduced in its most early stage; for, if the reduction be delayed, the ovary soon becomes adherent to the peritoneal sac in which it is included, and acquires an increased size, so that it no longer admits of being replaced. In this circumstance, if the patient suffer much inconvenience, or pain, from the disease, the only mode of relief consists in extirpating the tumour.

The ovary, together with a part of the Fallopian tube, has been found protruded in large crural herniæ‡; and likewise in hernial swellings, which took place at the great sacro-ischiatic foramen.§ The same organ has also been known to protrude

* Lassus, *Pathologie Chirurgicale*, t. ii. p. 100.

† *Ibid.* p. 101.

‡ Haller, *Disput. Chirurg. Selectæ*, t. iii. p. 41. and Lallement, *Bulletins de la Faculté de Médecine*, 1816, No. 1.

§ Sabatier, *Médecine Opératoire*, t. ii. p. 425. Papen, *Epistola de Stupenda Hernia Dorsali*, in Haller's *Disp. Chir.* t. iii. Camper, *Demonstr. Anat. Pathol.* l. ii. p. 17.

through a penetrating wound of the belly.* Here the reduction, owing to the size of the opening, would be attended with no difficulty.

CHAPTER IX.

ISCHIATIC HERNIA.

IN this case, the viscera protrude at the sacro-ischiatic foramen, producing one of the rarer species of rupture: the records of surgery do not furnish the history of many instances of it, and some of these will be received with considerable distrust by an intelligent reader. Sömmerring† reckoned only six cases, which could be depended upon; viz. one related by Papen‡; two mentioned by Verdier§, as having been seen by Bertrandi and three others, recorded by Camper||, Bose¶, and Lassus.** Whether the first and last of these six cases were truly ischiatic herniæ appears questionable to my friend Mr. Lawrence††; and I think him perfectly right in not admitting the last example in particular, as the details furnished by M. Lassus warrant no positive conclusion; but the nature of Papen's case having been determined by dissection, I conceive that its veracity rests upon better foundation. Subsequently to the period when Sömmerring made the above calculation, at least five other cases of ischiatic hernia have been noticed: one is reported by Mr. A. Cooper‡‡; two were observed by Schreger§§; a fourth was communicated to the

* Ruysch, Obs. Anat. Chirurg. xvi. p. 16.

† Über die Ursache, Erkenntniss, und Behandlung der Brüche am Bauche und Becken ausser der Nabel—und Leistengegend. Frankfurt, 1811.

‡ Epist. de Stupenda Hernia Dorsali, in Haller's Disp. Chir. t. iii.

Mém. de l'Acad. de Chir. t. ii. p. 2.

|| Demonstrat. Anat. Pathol. lib. ii. p. 17.

¶ Programma de Enterocoele Ischiadica. Lips. 1772.

** Pathologie Chirurgicale, t. ii. p. 103.

†† Treatise on Ruptures, p. 532. edit. 3.

‡‡ On Hernia, part 2. p. 73.

§§ B. G. Schreger, Chirurgische Versuche, 2ter. B. 8vo. Nürnberg, 1818.

latter surgeon by Bezold *; and a fifth additional instance is described by Monro.†

After a review of the principal cases upon record, Professor Schreger offers the following general remarks upon the ischiatic hernia.

Whether one sex is more liable to it than another appears doubtful; for whether the patients were males or females is not stated in Bertrandi's two cases; and of the other instances (comprehending that mentioned by Mr. A. Cooper, which Schreger seems not to have known of), four of the patients were males, and four of them women. The disease appears to have occurred more frequently on the right than the left side; for, of nine cases which the latter surgeon had either seen or heard of, six were on the right, and only three on the left. In the fetus, the ischiatic hernia may be of various sizes; in the infant which Schreger found born with such a protrusion, the swelling was about as large as a chesnut; while in the child seen by Bezold, it reached from the buttock to the ham; and in Papen's example, the tumour, after existing ten years, was an ell in length.

According to Schreger, congenital ischiatic ruptures (at least their outward dimensions) present a broad base; this appearance was remarked, both in the case which he saw himself, and in that which fell under the observation of Bezold: whether the swelling, in its subsequent advances, becomes of a more circumscribed form, the experience of that writer had not enabled him to decide. In Papen's example, the lowest part was the thickest, the tumour becoming gradually smaller up to its cervix, which was thin: Camper also describes the fundus of the hernial sac as being wider than the neck.

The ischiatic rupture sometimes contains simply a piece of intestine or bladder, or, as Camper's example proves, it may include one of the ovaries alone. In other instances, like that related by Papen, the swelling was larger, and the contents numerous, small and large intestines, the uterus, ovary, and Fallopian tube.

Schreger observes, it has been supposed that such ischiatic herniæ as are congenital, are attended with a malformation of the bones or soft parts at the bottom of the pelvis, from or with which defective structure the protrusion of the viscera originates. But Papen and Camper, who had opportunities

* In Siebold's Samml. Chir. Beob. 3 B. 5293. tab. 3.

† Morbid Anatomy of the Gullet, &c. p. 380.

of dissecting * their cases, make no mention of any such malformation; and Schreger, after carefully dissecting one of the cases which fell under his notice, could detect no difference between the anatomy of the healthy and diseased side of the pelvis. It was also to be inferred, that the bladder had rather accommodated itself to the parts encompassing it, because just at the point where it emerged from the pelvis, it was contracted into a very narrow canal; a circumstance that would not have existed, if the disease had been owing to an original malformation of the pelvis. Bezold remarked in his case, that after the bowel had been reduced, the finger could be introduced more deeply by the side of the os coccygis, or into the ischiatic foramen; and also, that the preceding bone was blunt, and not natural. Yet, as Schreger observes, it should here be recollected, in order to avoid deception, that in children the os coccygis is not completely developed, that its inferior termination is still soft and cartilaginous, and consequently that its inferior extremity is very likely not to be felt.

Schreger thinks it highly probable, that the congenital ischiatic rupture is produced in the early stage of the formation of the fœtus; and, although Siebold is inclined to believe, that the protrusion may depend upon an accidental loss of substance at the back part of the pelvis, occasioned by external violence, there is no evidence of the reality of this conjecture. The woman spoken of by Papen was fifty years old, and only ten years before her decease, first noticed near the anus a small swelling, which gradually enlarged. It appears, therefore, that such a hernia may augment as the patient grows older, without any original malformation, or absolute loss of substance, having any share in its production and increase. Should further experience prove, that ischiatic ruptures are more frequent in female than male subjects, the circumstance might perhaps be accounted for by the larger dimensions of the ischiatic notch, its greater distance from the sacrum, and the more considerable extent and elasticity of the sacro-ischiatic ligaments in the former sex. †

A case, which I shall presently recite from the industrious author, to whom I am indebted for most of the preceding views of the subject, furnishes us with a proof, that an ischiatic rup-

* Monro says, "The hernia called ischiatic may perhaps be occasioned by a malconformation, for the pyriform muscle, sciatic nerve, and small vessels, completely fill up the sciatic notch in the natural state." *Morbid Anatomy of the Human Gullet, Stomach, &c.* p. 379.

† Schreger, *Chirurgische Versuche*, b. ii. p. 156—161.

ture may sometimes inflame and suppurate, and yet afterwards admit of being reduced with a successful result.

Small ischiatic herniæ (which, by the by, are very difficult to detect in the living body, on account of their being concealed by the glutæus maximus) are said generally to be reduced with ease; while larger swellings of the same nature, owing to the narrowness of the mouth of the hernial sac, and want of room in the cavity of the abdomen, never admit of being reduced all at once, but only by degrees and by repeated endeavours; or else their reduction appears to happen of itself when the patient is confined a considerable time in bed, with a compress and bandage applied. If the case, reported by Lassus, were truly an ischiatic hernia, the cure was effected in two months by the latter method; in all probability, however, the disease was not a hernia, but nothing more than some other kind of tumour or abscess, which yielded to such treatment. In Bezold's case, the bowels are stated to have returned gradually into the abdomen, when the infant was six weeks old, the almost continual pressure of the mother's hand upon the tumour in nursing the child having had a very useful effect in promoting the reduction.*

Examples of ischiatic herniæ may occur, however, where the reduction is totally impracticable, either from adhesions existing between the protruded viscera and the mouth of the hernial sac, as happened in Schreger's second case; or from the general displacement of nearly all the abdominal viscera, as was seen in Papen's patient, who, when she went to work, usually supported the immense swelling with a napkin suspended over her back.

Schreger, who was unacquainted with Dr. Jones's case, reported in the second part of Mr. A. Cooper's valuable work on hernia, tells us, that no instance of this rupture being strangulated is upon record; and with the exception of the single instance here alluded to, I believe his remark is perfectly correct.

The following is one of the cases, which fell under the observation of Professor Schreger. A male child was born with a moderately elastic swelling upon the right buttock, near the anus. The tumour was an inch and a half in circumference, and projected about three quarters of an inch. As the child seemed lively and well, the parents and midwife gave themselves no further concern about the swelling. A week after birth, the integuments covering the disease began to inflame,

* Siebold's Samml. Chir. Beob. s. B.

and the child to be in a state of pain and restlessness: these effects being probably induced by the swelling being continually lain upon, and the irritation of the urine, with which it was generally wet. Goulard's lotion was now applied. Two days afterwards, this supposed boil was shown to Schreger; the tumour pointing, and ready to burst. As this event was unavoidable, and the disease had every appearance of being only a common abscess, a poultice was ordered. On the same day, the swelling burst by a very small opening, from which a little matter, blended with a quantity of liquid feces, was discharged, when the tumour in a great measure subsided. These circumstances made Schreger very attentive, as it was now evident to him, that the case was nothing less than an ischiatic hernia in a state of suppuration. This truth was still further proved on laying the child upon its left side, and pressing inwards the most elevated part of the tumour with the point of the fore-finger, or pushing inwards its contents by applying the points of several of the fingers to its circumference; for, when either of these experiments was made, no pain was experienced while the return of the piece of bowel into the abdomen could be plainly distinguished with the fingers, a small aperture, like that of a broken boil, being alone left in the skin; and when the pressure was discontinued, or the child cried, the same portion of intestine protruded again more or less suddenly, and the integuments became distended to their former state. Schreger, after reducing the bowel, applied a thick compress, wet with Goulard's lotion, and kept on with a bandage. On the third day the opening closed; and in a week the swelling and discolouration of the skin were entirely gone, and the child perfectly well.*

Another case of ischiatic hernia is reported by the under-mentioned writer. A male child, one year old, was brought to Erlangen for surgical advice, on account of a congenital tumour, that had not materially increased since birth. It was situated on the left side of the sacrum, spreading upwards to the left buttock, and also downwards; it was apparently quite circumscribed, round, elastic, and tense, but not hanging down like a pouch; and, though it was evidently moveable, some degree of adhesion could be distinguished in the middle of its base. When compressed, it was free from pain, and its size remained without alteration. Its greatest projection was about an inch and three quarters, and its base about two inches and a half in diameter. The child was

* Schreger, *Chirurgische Versuche*, b ii. p. 164. 8vo, Nürnberg, 1818.

healthy, and could lie upon the tumour; and the parents had never remarked any disturbance of the intestinal, or urinary evacuations, nor any alternate increase and decrease in the size of the swelling. This account made Schreger, and the other practitioners consulted, renounce all suspicion of an ischiatic hernia, and regard the disease as a congenital encysted tumour. On this supposition, its extirpation was undertaken. The child was laid upon its belly; a longitudinal cut was made through the skin; and the subjacent depth of fat was cautiously divided by little strokes of the bistoury, in search of the expected cyst, something like which was soon discovered, and an endeavour made to extract it. Accidentally, however, it was wounded, when about an ounce of a bright yellow transparent fluid gushed out to the height of two feet. The sac immediately collapsed, but it was taken hold of with a pair of forceps, and the detachment from the surrounding parts continued. Its base could not, however, be separated; but seemed for an extent of about two lines not to admit of being parted from the subjacent cellular substance. As this connection was regarded by the surgeon merely as a kind of adhesion, frequently met with in cases of encysted tumours, he decided to cut through the root of the swelling. What remained appeared like a small, funnel-shaped, hollow, finely-plaited surface, the folds of which were all concentrated towards a deep central point, and by degrees it collapsed and shrunk up. The portion of the sac which had been cut away, consisted externally of several irregular membranous layers, while its inner surface was unevenly folded, and had a hard stiff feel. Suffice it here to state, that the wound was dressed, and the child continued well during the rest of the day; but that, in the evening, febrile symptoms and convulsions came on, and death took place about the middle of the following day. The inspection of the body proved, how mistaken the surgeons had been respecting the nature of the disease, which was found to be an ischiatic hernia, and a new species of cystocele, unless the case alluded to by Haller* is to be regarded as an earlier example of the same uncommon kind of rupture. On opening the body, the bladder was found, not as it usually is, with its fundus directed upwards, but as a more oblong bag, which was drawn down backwards and to the left side towards the os sacrum and bottom of the pelvis, together with the reflection of the peritonæum, its roundish and wider end terminating in a cavity at the inner

* See Elem. Phys. t. vii, p. 305.; and Phil. Trans. No. 411.

edge of the rectum. This broad portion of the bladder, on further examination, appeared to be continued into a very narrow duct-like process, not more than two lines in diameter, which was adherent to the sides of the above-mentioned cavity. The hollow here alluded to, was precisely opposite the external wound, and hence the suspicion increased, that the cyst, which had been cut away the preceding day, was connected with the bladder. A small probe was therefore introduced through the triangular sinus, leading from the surface of the wound, and it went without any difficulty through the hollow tube-like process into the cavity of the bladder.

After the parts had been carefully detached, they were taken out, and, according to Schreger, exhibited a very peculiar original malformation: the bladder appeared to be divided into two bags, communicating together by an intervening constricted portion. Into that which lay in the pelvis, the ureters opened, the constricted part was situated in the ischiatic foramen, upon the sacro-ischiatic ligament, between the pyriformis and gemelli muscles, which were pushed away from each other. The other bag, which formed the ischiatic hernia, lay under the skin on the outside of the pelvis, and was in fact the cyst that had been mistaken for that of an encysted tumour, and consequently cut away. It was also manifest, that it was a part of the fundus of the bladder which externally had a hernial sac, to which it was adherent, partly composed of its own peritoneal reflection, and partly of the mesorectum. Hence, in cutting down to the supposed encysted swelling, various membranous layers were observed to be divided. The ischiatic foramen, the ligament, the large sciatic nerve, and the adjacent muscles, the os sacrum, and os coccygis, were all remarked to be free from every anatomical imperfection.*

The protruded portion of the bladder had three coverings, viz. the cutis, under which was the mesorectum, and then the duplicature of the peritonæum; which is naturally spread over the back of the fundus of the bladder. The latter investment was adherent to this viscus, as it always is; but preternatural adhesions had also taken place between this part of the peritonæum and the mesocolon.

The diagnosis of an ischiatic rupture is extremely difficult; and owing to its deep situation beneath the glutæus maximus, there can be but little chance of detecting it in the living subject while the tumour is very small. Hence, when Mr. Law-

* Schreger's *Chirurgische Versuche*, b. ii. p. 167—172.

rence published the last edition of his excellent treatise on hernia, he did not consider that any unequivocal instance of the disease had ever been noticed in a living subject, excepting, perhaps, the case recorded by Papen. To this must now be added the two examples related by Schreger*, where the tumours were remarkably prominent, and attended with circumstances which could not but excite attention. Yet, as we have seen, the real nature of the disease was in the first of these cases only ascertained by the accidental rupture of the swelling and discharge of the feces from the opening; and, in the second, by the issue of urine from the wounded cyst, and the appearances found in dissecting the child's body after death. In Schreger's cases, however, there is one circumstance which seems to me rather unintelligible, viz. his description of the tumour lying directly under the integuments. If this were really a fact, what could have become of the *glutæus maximus*, more especially in the curious instance of the ischiatic cystocele? For, in the other case, I can suppose very well, that the abscess had made its way downwards, so as to burst below the margin of that muscle.

In forming an opinion with regard to a swelling being truly an ischiatic rupture, the surgeon must consider a variety of circumstances. First, the situation of the tumour may raise a suspicion, which would be strengthened by the fact of the swelling being congenital, and of a shape not generally observed in other tumours; for instance, conical, as was remarked in the example recorded by Bezold. This figure of the tumour, however, is only incidental, and not confined to this species of hernia. Conviction cannot be produced, unless the bowels be distinctly felt composing the contents of the swelling, and they happen to be, at the same time, so moveable, that after being reduced they descend again. But the surgeon will never be able to feel these circumstances plainly, except where the protrusion is considerable, and the intestines are distended with air. When the tumour is small, and situated under the *glutæus maximus*, and a large quantity of adipose substance, an examination with the fingers will afford little information which can be depended upon, especially when the tumour is tense from inflammation, as happened in one of Schreger's cases. The possibility of reducing the protruded parts is also by no means constant; it existed in the first example recorded

* The case seen by the father of Dr. Monro junior appears to have been ascertained while the child was living, and the swelling is described as large. *Morbid Anatomy of the Gullet, &c.* p. 380.

by this author, but not in his second case, nor in those reported by Lassus and Bezold. Yet, in the two latter, if the histories can be implicitly believed, there could have been no adhesions between the viscera and the hernial sac, for then the consequent reduction, which was gradually effected, must have been a matter of impossibility. The small dimensions also of the aperture through which the protrusion happens, must frequently render the reduction difficult and impracticable. Under these circumstances, I think with Schreger, that a surgeon should not be hasty in delivering his opinion, but wait, and see whether time may throw any light on the diagnosis. In the meanwhile the patient should be kept in bed, and gentle pressure employed, in order to try whether a gradual reduction of the tumour can be accomplished. *

In enormous protrusions of the viscera, the existence of a hernia may be in some measure suspected from the emptiness of the abdomen, as Bezold had occasion to remark.

In forming a judgment respecting the presence of an ischiatic cystocele, the symptoms attending protrusions of the bladder in general should be recollected. In Schreger's case, however, they were not such as to throw any light upon the nature of the disease; and, in children, considerable obscurity is occasioned by the impossibility of getting any information from themselves.

The surgeon must avoid mistaking an ischiatic rupture for an adipose, or encysted swelling; an error, however, which is scarcely possible, when the protrusion of intestines is large, and characterised by unequivocal symptoms, especially the possibility of feeling the motion of air within the bowels. An enterocele is likewise tense and elastic; a fatty swelling soft, and of a doughy feel. Yet, it is to be remembered, that these marks of discrimination may not avail in cases of encysted tumours, which are often nearly as elastic as a hernia; and, in Schreger's example of cystocele, the feel of the swelling communicated no positive information as to its nature. Except when encysted tumours have been inflamed, and become adherent to the subjacent parts, they admit of being moved about freely under the skin; while a hernia is always more or less prevented from moving in this ready way, at least at the point where the protrusion begins. Adipose sarcomatous swellings, however, are sometimes not more moveable under the skin than a hernial tumour, and the two diseases may, in this respect, resemble each other.

* Schreger, *Chirurgische Versuche* b. ii. p. 175, 176.

Pressure will sometimes reduce a hernia into the cavity of the abdomen, and, as soon as it is discontinued, the bowels will protrude again; but it produces no such changes on an encysted swelling. But, sometimes, an ischiatic rupture cannot be pushed back into the abdomen, though the viscera may not be adherent; while an encysted swelling, situated upon a soft yielding surface, may, when pressed upon, seem to be a reducible tumour, while it merely sinks into a temporary depression.

How easily an ischiatic rupture, which is accidentally-inflamed, may be mistaken for a boil, or abscess, the first of Schreger's cases fully proves.

The ischiatic hernia, says Schreger, has, in its external appearance, a good deal of resemblance to the swelling termed spina bifida, which is sometimes seen upon the os sacrum of young infants. The latter tumour, especially when small, is elastic, and diminishes, or even disappears, when compressed, but rises up again when the pressure is omitted. A spina bifida, however, may generally be known by its not being placed at the side of the sacrum, like a hernia, but rather on the middle of that bone; by the pain * which accompanies it, though the skin be free from inflammation; by a fluctuation; and, not unfrequently, by its transparency. †

CHAPTER X,

HYDROCELE.

OF this disease there are three principal kinds; one, in which the fluid is lodged in the cellular texture of the scrotum; another, in which it is contained in the tunica vaginalis testis; and a third, in which the fluid collects in the spermatic cord.

* As far as my experience goes, however, spinæ bifidæ are not characterized by pain.

† Schreger's *Chirurgische Versuche*, b. ii. p. 177—179. Besides the curious examples of ischiatic herniæ described by this writer, I find in his second volume a relation of two instances of a kind of rupture not noticed in any other work: viz. the hernia arising from the bowels, pushing down a portion of the rectum in the form of a sac. It is a case very analogous to the vaginal hernia, and is named by Schreger the "*Mastdarmbruch*;" *Hedrocele*, or *Archocele*, from *ἔδρα*, the rectum, and *ἄρχος*, the posteriors.

The first sort, sometimes named *hydrocele œdematodes*, is strictly only an anasarcaous tumour of the scrotum, and generally a symptom of a dropsical affection of the whole constitution. The two other kinds are absolutely local, commonly attack one side only, and are frequently found in persons who are perfectly free from all other complaints.

HYDROCELE ŒDEMATODES

Is a swelling of the scrotum, mostly arising from a gradual effusion of limpid fluid in the cellular membrane of the part: it is softish and pale-coloured, and, when touched with the finger, the impression continues for some time afterwards. As the disease increases, however, the part becomes firmer, smoother, and tenser, the corrugations being at length entirely effaced. The neighbouring parts, especially the penis, are generally affected at the same time, and the latter organ is often surprisingly deformed, the prepuce being sometimes so swelled as to obstruct the free discharge of the urine. In the worst stages of the disease, the extreme tension of the skin and cellular membrane brings on inflammation, suppuration, and sloughing.

The most frequent causes of this species of hydrocele do not differ from those which are concerned in the production of ascites and œdema in general. The pressure also of certain tumours upon the large veins and lymphatics within the abdomen; the accidental rupture of a hydrocele of the tunica vaginalis, or the water of this last disease not having a ready outlet through the puncture in the skin, in consequence of the aperture having changed its situation with respect to the opening in the tunica vaginalis, after the lancet is withdrawn; violent contusions of the scrotum; the pressure of a very tight ill-made truss; are all circumstances which may give rise to an œdematous hydrocele. In infants, this kind of swelling is often the effect of the pressure sustained during delivery, and of the part being exposed to the irritation of the urine.*

From the few preceding remarks it is sufficiently clear, that the hydrocele œdematodes may be either *idiopathic*, or *symptomatic*.

TREATMENT OF HYDROCELE ŒDEMATODES.

Here it is necessary to find out, and, if possible, remove, the causes of the disease. When the complaint is merely an

* Callisen, *Systema Chirurgiæ Hodiernæ*, vol. ii. p. 64.

effect of a dropsical tendency in the whole system, the possibility of a cure will of course depend upon the success with which the general indisposition can be combated, or removed. Thus, if the ascites cannot be cured, it will be in vain to expect to disperse the dropsical affection of the cellular membrane of the scrotum. In particular examples, however, the hydrocele œdematodes is quite a local disease, and in this state, it is to be treated according to the rules laid down in the chapter on œdema.

HYDROCELE OF THE TUNICA VAGINALIS.

This complaint has generally the appearance of a smooth, oblong, or pyriform swelling of one side of the scrotum.* It is not attended with any discolouration of the skin, and, if carefully watched from the beginning, it is observed at first only at the lower part of the scrotum, whence it gradually spreads upward, until it reaches the higher part of the spermatic cord, on the outside of the ring. The ordinary shape of the tumour somewhat resembles a swan's-egg pear, with its broader part downwards. In an early stage, it presents a softish feel, attended with fluctuation; but, on the fingers being removed, it immediately rises to its former level. It cannot be diminished either by pressure, or by making the patient lie down upon his back; it cannot be pushed into the cavity of the abdomen by any artifice of the surgeon; nor can any impulse be distinguished in it, when the patient coughs; circumstances particularly marking its difference from hernia. When the disease is more advanced, and has attained a larger size, the tumour becomes oblong, and its weight and firmness increase, though they are still much less than in cases of common sarcocoele. At the same time, the fluctuation grows less distinct. If the fluid in the tunica vaginalis be clear, this membrane and the cremaster not much thickened, and a candle be placed behind the tumour, the scrotum will be found to have a semitransparent appearance. Whenever the quantity of fluid is at all considerable, the testicle cannot be plainly

* "Morbus interdum in utroque latere scroti occurrit." Callisen, *Syst. Chirurgiæ Hodiernæ*, vol. ii. p. 76. A hydrocele of the tunica vaginalis is also sometimes accompanied with an encysted hydrocele of the cord, which case is known by the tumours having originated at two different points. There is also a constriction quite evident between them; but this is not a sure criterion, as the sac of a common hydrocele is sometimes divided, by a middle contracted part, into two cavities, which, however, communicate. Richerand, *Nosographie Chirurgicale*, t. iv. p. 268. edit. 4.

felt, being distinguishable only at the upper and back part of the tumour, by a certain hard feel. The spermatic cord, however, is still obvious to the touch. Even when the swelling has acquired its greatest size, and the scrotum is considerably distended, the corrugations are seldom so completely obliterated as they are in the œdematous hydrocele. The penis appears small, and, as it were, buried in the tumour. In cases of long standing, the integuments of the scrotum are sometimes much thickened; the veins are large; and, upon handling the swelling, a sense of elasticity, rather than of fluctuation, is communicated. When the hydrocele is of very great size, the spermatic cord itself may be concealed by it nearly, or quite up to the ring. In children, the water commonly extends higher up the cord, than in adults.*

The quantity of fluid varies in different cases; a hydrocele of ordinary size contains about six, eight, or ten ounces; but instances are recorded, in which four †, and even six ‡ pints of water have been drawn off. The disease is rather inconvenient, on account of its size and weight, than painful, or dangerous. When large, however, and not supported in a bag-truss, it drags the spermatic cord, and creates pain in the loins. It also interferes with every kind of labour, in which the lower extremities are concerned, and prevents the individual from riding on horseback. Hence, many persons who have hydroceles, cannot follow the particular avocations on which their livelihood depends, and are compelled, as it were, to submit to whatever may be necessary for the cure. The manner also, in which the swelling draws the integuments from the penis, prevents the full erection of that organ; a circumstance which is frequently a source of great anxiety; because the patient, not understanding the precise nature of the disorder, is apt to suppose his virility irrecoverably impaired. When the swelling is very large, the penis is completely retracted, and the urine, dribbling over the front of the scrotum, is liable to bring on a good deal of inflammation, and even troublesome ulcerations, unless the greatest attention be paid to cleanliness. § The transparency of the tumour, and its freedom from pain, have been supposed to be sure indications of this species of hydrocele; but, according to the observ-

* J. Hunter, *Observations on Certain Parts of the Animal Economy*, p. 12. edit. 2.

† Wadd's *Cases of Diseased Bladder and Testicle*, p. 61. 4to. London. 1815.

‡ Earle on Hydrocele.

§ Richter, *Anfangsgr. b. vi. p. 66.*

ations of Mr. Warner, these symptoms are not infallible. This surgeon assures us that he has had under his care enlargements of the testicle, where the disease had the greatest resemblance to hydrocele, in form, in size, in transparency, and in exemption from pain. "Upon holding a lighted candle on one side of the scrotum in a dark place, and looking at the tumour on the other side, a perfect transparency was perceptible. From these appearances, so common in a hydrocele of the tunica vaginalis, where the disease is not accompanied with a turbidness, or bloody discolouration of the contained fluid, it would have been almost impossible not to have been mistaken in the nature of this complaint, if, upon a careful examination of the parts, it had not appeared, that no fluctuation could be discovered by the feel, which, I am convinced, sometimes requires the greatest accuracy and judgment absolutely to determine. However, that I might not give a positive opinion of the nature of the disease, without making a more certain enquiry; after having for several weeks used fomentations, mercurial frictions, and repellent cataplasms to the part, joined with brisk purges, and emetics, administered at proper intervals, without any effect, I resolved, with the consent of the patient, to puncture with a lancet the inferior part of the tumour; but there issued not the least discharge of water, nor any other kind of fluid through the aperture; nor was the experiment attended with any other inconvenience, than a slight inflammation of the edges of the wound. *

Sometimes, in certain enlargements of the testicle, there is an appearance of transparency, but it is confined to the lower part of the swelling: this happened in a case noticed by Mr. Cross in La Charité, at Paris, and was fully accounted for by a small quantity of transparent fluid found in that portion of the tumour, after an operation.† But, in Mr. Warner's case, as no fluid seems to have been present, I know not how to explain the cause of the transparency, except by supposing that the swelling contained a large quantity of effused coagulable lymph.

Scarpa, who has carefully examined hydroceles in the dead subject, assures us, that, whenever the tumour is large, the spermatic vessels are found so displaced and separated, that the artery and vas deferens usually lie on one side of the swell-

* Warner's Cases in Surgery, p. 289. edit. 4.

† See Cross's Sketches of the Medical Schools of Paris, p. 140, 141, 8vo. Lond. 1815.

ing, and the veins on the other; and that sometimes all these different vessels extend from the sides towards the front of the tumour, chiefly at its lower part.* In treating of hydrocele of the tunica vaginalis, many writers of great eminence have been entirely silent respecting the cremaster muscle, though, as Scarpa observes, anatomy teaches us, that this part and its aponeurosis have an intimate connection with the disease, the collection of water being, in reality, contained within a double sac, formed of very distinct layers, one being the muscular sheath and aponeurosis of the cremaster, the other the tunica vaginalis testis. In large, old hydroceles, the first, or exterior of these investments, acquires considerable strength and thickness, while the tunica vaginalis itself mostly remains in the natural state. In the operation for hydrocele, the surgeon should be well apprised, that he has to pierce a sac formed of two separate layers, very different in their structure, and capable of slipping, as it were, over each other.†

Here it is but justice to remark, that the animadversion of Scarpa respecting the silence of writers about the intimate connection which the cremaster muscle has with hydrocele, should not be extended to several English authors, who have been very careful to notice this important circumstance. In a hydrocele, as well as a rupture, the cremaster (says Mr. Hunter) "becomes stronger than usual, and its fibres can be traced spreading on the tunica vaginalis, and seem at last to be lost upon it near to the lower end of the body of the testicles."‡ The expansion of the cremaster over the tunica vaginalis in hydrocele, is also particularly noticed both by Warner§ and Mr. C. Bell.||

A hydrocele should be carefully distinguished from a hernia, which it may always readily be, by adverting to those differences which have been already pointed out; particularly, to the absence of all impulse in the tumour when the patient coughs, the unchanged size of the swelling in every position of the body, and the quiet undisturbed state of the intestinal canal.¶

* Scarpa, *Traité Pratique des Hernies*, p. 64.

† Scarpa, *op. cit.* p. 51.

‡ *Observations on Certain Parts of the Animal Economy*, p. 6. edit. 2.

§ *Cases in Surgery*, p. 288. edit. 4.

|| *Operative Surgery*, vol. i. p. 194. 8vo. Lond. 1807.

¶ A hernia and hydrocele of the tunica vaginalis may exist together; a complication known by considering the symptoms peculiar to each affection. In cases of strangulated bubonocoele, accompanied with such a hydrocele, the operation for the hernia may prove a cure of the other disease, by accidentally exciting inflammation and sloughing of the distended tunica vaginalis. See a case to this purport related by Flajani, *Collezione d'Osservazioni*, &c. t. ii.

Fungus hæmatodes testis is more liable to be confounded with hydrocele than any other disease; for the swelling of the testicle is so elastic, and the feel which it communicates so like that of a fluid, that many surgeons of great judgment and experience have been deceived, and actually introduced a trocar into the substance of the tumour. But, as this is a subject which will be considered again in the following chapter, I need not dwell upon it at present.

The discrimination of a hydrocele from a common sarcocele, or scirrhus testicle, is attended with no difficulty; for, the hydrocele is compressible, indolent, and much lighter than it would be if the substance of the swelling were of a fleshy nature. At the same time, it is even and uniform, and accompanied with a fluctuation that is always obvious enough, except when the great tension of the swelling communicates rather the feel of simple elasticity, than that of the positive presence of a fluid. On the contrary, a scirrhus testicle is an indurated, heavy, irregular painful tumour, unattended either with fluctuation or transparency.

CAUSES OF THE HYDROCELE OF THE TUNICA VAGINALIS.

This part of the subject is very obscure, and little certain is known concerning it. In general, the complaint appears to originate spontaneously; but it has been sometimes observed to follow a bruise, or the friction which the scrotum suffers in hard riding; and, if any faith can be put in the conjectures of the late Mr. Ramsden, it would appear, that the origin of this disease is sometimes owing to an irritable state of the urethra.* The disease has been known to originate during an attack of the rheumatism.† Exposure to cold, and the pressure of ill-constructed trusses on the spermatic cord, are also alleged to be sometimes the cause of the disease. Hitherto, I am afraid, it cannot be truly said, that our surmises respecting the causes of hydrocele, have afforded any material light in the investigation of the treatment. Fortunately, this imperfection in our knowledge is here not of much consequence, as the practical surgeon is only anxious to have a safe and certain method of cure, and this he already possesses. The complaint frequently affects the most healthy and robust, and young subjects as well as old ones: it has no connection with a general dropsical

* See Ramsden's Practical Observations on Sclerocele, &c. p. 198—201.

† Stoll, *Ratio Medendi*, t. iii. p. 132.

habit or debility; and it is generally, perhaps always, quite a local affection.

PROGNOSIS.

The prognosis in hydroceles chiefly depends upon the state of the testicle and of the patient's health; for, when this is good, the collection of fluid in the tunica vaginalis is to be regarded as a simple complaint, rather attended with inconvenience than risk; though, if the statements of some writers be correct, the long-continued pressure of the water upon the testis, when the swelling is of very considerable size, may induce an atrophy of that organ. When, however, the effusion of fluid in the tunica vaginalis is a consequence of a disease of the testis, constituting a hydro-sarcocele, the prognosis is unfavourable, because the hydrocele cannot be cured, unless the testis either admit of being restored to its natural state, or be removed by an operation. With very few exceptions, if the surgeon were, in the case of a hydro-sarcocele, to aim only at removing the fluid, the means he would be obliged to employ would have the bad effect of exasperating the other more serious disease, in a degree that would render every future measure unavailing. In general, when a hydrocele is left to itself in adult subjects, no cure can be effected by nature alone; but, when properly treated, it may almost always be removed both with safety and certainty. In young persons, the cure is still easier; and in children under seven years of age, nature, without any assistance, not unfrequently disperses the complaint.* Sometimes the tumour is so tense, that it bursts, or it is ruptured by external violence, or from an accidental effort of the patient, and the fluid is effused in the cellular membrane of the scrotum. Accidents of this kind sometimes terminate in a radical cure.† There are two methods of treatment, one called *palliative*, the other *radical*.

PALLIATIVE CURE.

This consists in merely puncturing the tumour with a lancet, or small trocar, for the purpose of discharging the

* Callisen, *Systema Chirurgiæ Hodiernæ*, vol. ii. p. 68.

† A remarkable confirmation of this statement was lately mentioned to me by Dr. Somerville: a surgeon had a hydrocele, for which he would suffer no operation to be done. But, though he was averse to having wine thrown into his scrotum, he had no objection to a little of it in his stomach, and getting rather tipsy one day, he ran against a post, bruised his scrotum, and ruptured the hydrocele. The event was a permanent cure.

fluid. The latter instrument should generally be preferred, as the cannula facilitates the escape of the water, and prevents its diffusing itself in the cellular texture of the scrotum. When, however, the hydrocele is small, or the nature of the disease is at all doubtful, a lancet ought to be used, as an opening can be more cautiously made with it than with a trocar, the sudden introduction of which might injure the testicle. This precept deserves attention, because there are surgeons who think that the fluid of a hydrocele should be let out as soon as a puncture can be made with security, alleging, as a reason for the practice, the greater probability of the absorbents being able to resume their functions, and complete the cure while the disease is recent, and the tunica vaginalis unthickened, than at a later period.* When a hydrocele is large, the palliative treatment ought first to be practised, and the radical cure not undertaken till the tumour has acquired again about two-thirds of its former magnitude. The reason of this advice is founded on what experience had taught the late Sir J. Earle, viz. that when the radical treatment is applied at once to a large tense hydrocele, the inflammatory symptoms often run to an unnecessary height. As hydroceles are not unfrequently complicated with disease of the testicle and spermatic cord, and the exact state of these parts, especially of the testicle, cannot always be determined, while the tunica vaginalis is considerably distended, the surgeon sometimes finds it necessary to let out the fluid, in order to ascertain whether the case be a simple hydrocele or not. In fact, until all doubt be removed concerning the sound state of the testicle, the practitioner cannot know what further proceeding should be adopted; that is, whether the case ought to be treated as a common hydrocele, or as a hydro-sarcocele, in which latter disease, the means customarily adopted for the radical cure of the other affection, would be both inapplicable and hazardous.†

With whatever intention the operation is undertaken, the surgeon should be sure of the presence of fluid before the

* See Wadd's Cases of Diseased Bladder and Testicle, p. 54. 4to. Lond. 1815. This gentleman mentions a hydrocele, which was let out with a trocar at the end of a fortnight, and did not return. Mr. Pott speaks of two similar cases; and, says Mr. Wadd, "a patient of mine lately shewed me a hydrocele, which contained half a pint of fluid, attributed to a blow he received on the testicle five weeks before. It was evacuated by puncturing with a lancet, and has not returned since."

† See Loder's Chirurgisch-Medicinische Beobachtungen, b. i. p. 154, 8vo. Weimar, 1794.

puncture is made; or, at all events, if a degree of doubt cannot be got rid of, a small opening should be carefully made with a lancet into the tunica vaginalis. When this has been done, and the disease is found to be not a simple hydrocele, but a thoroughly diseased testicle, (for instance, a fungus hæmatodes,) the surgeon should perform castration without further delay.

In a common hydrocele, the best place for the puncture is at the anterior and lower part of the tumour, the spot which is most remote from the testicle. At the same time, if the swelling be large, we are not to be unmindful of the possibility of the spermatic vessels lying over the sides, or even over the front of the lower part of the sac, and the cautions which Scarpa has offered on this subject to the operating surgeon. The trocar must not be introduced to an unnecessary depth, lest the testicle be injured; a danger which will also be more certainly avoided, if the point of the instrument be directed obliquely upward, and not too much backward.* In order also to hinder the trocar from suddenly penetrating too deeply, the thumb may be placed upon the instrument, about half or three quarters of an inch from its point. As soon as the stilette has entered the tunica vaginalis, it need be pushed no further, for it has done its office; on the contrary, the surgeon is now to withdraw it, and at the same instant push the cannula alone further into the cavity of the tunica vaginalis. The necessity of the cannula being well introduced, arises from the collapse of the preceding membrane, when the fluid escapes, and its consequent tendency to slip off the extremity of the tube, whereby the completion of the operation might be interrupted; and, in the radical cure, the prudence of having the end of the cannula effectually within the cavity of the hydrocele, is still more urgently dictated, as will be presently explained.

Although the anterior and lower part of the swelling is usually the best place for the puncture, it is not invariably so, because the direction in which the tunica vaginalis yields, is liable to be influenced by particular circumstances. The tumour is generally of an oval or pyriform shape, with its axis extending downwards; but sometimes the position of the swelling is oblique, or even completely transverse. In this last circumstance, if we are to believe Richter, it may be advisable to introduce the trocar on the right side of the

* C. Bell's Operative Surgery, vol. i. p. 199.

scrotum, notwithstanding the collection of fluid be in the cavity of the left tunica vaginalis. Such deviations of a hydrocele from its common shape, may perhaps be owing to external pressure, bag-trusses, tight breeches, &c.*

In the hydroceles of children, the testicle generally occupies a lower situation than in those of grown up persons, and the swelling extends higher up the cord, owing to the cavity of the tunica vaginalis naturally reaching further in that direction. Hence, in tapping the hydrocele of a child, (which, however, is hardly ever necessary,) the surgeon should introduce the trocar somewhat higher up than the place usually chosen in adults, and direct the instrument rather less obliquely backwards.† After the fluid is all discharged, the cannula is to be withdrawn, a small piece of soap plaster put over the puncture, and a bag-truss applied.

Such is the palliative operation, which commonly produces only a temporary removal of the swelling, as the water afterwards collects again, and the patient relapses into his former state. Hence, unless the same method be repeated from time to time, or the radical treatment adopted, the patient soon experiences all the inconveniences of the complaint again. The re-accumulation of the fluid is generally gradual, but cases have happened, in which the water collected again to its former quantity, as early as three or four hours after the operation. In one example of this kind, Flajani repeated the puncture next morning, and let out more than a pint of turbid dense fluid, and the disease afterwards never returned.‡ However, when the tumour forms thus suddenly again, it is almost always from an extravasation of the blood, constituting the disease termed *hæmatocele*. In a limited proportion of cases, the operation of simply tapping a hydrocele, and letting out the fluid, is unexpectedly followed by a permanent cure.§

* Richter, Anfangsgr. der Wundarzneykunst, b. vi. p. 59. edit. 2.

† Richerand, Nosographie Chirurgicale, tom. iv. p. 243. edit. 2.

‡ See Collezione d'Osservazioni e Riflessioni di Chirurgia di Giuseppe Flajani, t. ii. p. 164. 8vo. Roma, 1800.

§ See Loder's Chirurgisch-Medicinisch Beobachtungen, b. i. p. 158. A permanent cure is more likely to follow the simple tapping of the tumour, when a largish trocar or lancet has been used; when the cannula has rubbed against the testis; when the patient will not afterwards keep himself quiet (Flajani, vol. cit. p. 183.); neglects to wear a bag-truss; or is of a very irritable habit. In young persons, a radical cure has been the consequence of wetting the scrotum with lime-water after tapping. (Ib. page, 182.) Cases, which were hydro-sarcoceles and tapped, have sometimes terminated in a gradual disappearance of the fluid, that collected again on the testis

RADICAL CURE.

This is sometimes, though not very often, in adult subjects, effected by means of external applications to the scrotum; it may be more certainly accomplished by letting out the fluid, and either cutting away the loose part of the sac, or exciting such a degree of inflammation in the tunica vaginalis and testicle, as leads to an universal adhesion of the inner surface of this membrane to the tunica albuginea, and, consequently, to a complete obliteration of that cavity in which the water is collected. Without such obliteration, it has been generally supposed, that the relief would always be only temporary. This is an opinion, however, which has of late years been rendered questionable by the observations of Mr. Ramsden *, Mr. Wadd †, and Mr. Kinder Wood. ‡ The latter gentleman finds, that, if the tumour be punctured with an abscess lancet, and a little bit of the sac be drawn out with a hook, and cut off, a very mild inflammation of the cavity follows, unattended with confinement or general indisposition, and frequently ending in a radical cure, *though no obliteration of the cavity of the tunica vaginalis be produced*. The correctness of this statement, Mr. Wood conceives, is further corroborated by a reference to cases, in which a radical cure is brought about by discutient applications. These sentiments, however, stand in need of confirmation by dissection; for not only might the foregoing writer be deceived in the judgment which he formed from the external feel of the scrotum, that no adhesion had taken place between the tunica vaginalis and tunica albuginea, but also with respect to another opinion, viz. that when a hydrocele is cured by external applications, no such adhesion takes place. In one patient, who died some time after he had been cured of a hydrocele by the lotion of muriate of ammonia, Mr. Keate assures us, that the tunica vaginalis was found closely adherent at every point to the tunica

regaining a healthy state (Flajani, t. ii. p. 181.) If, says Bertrandi, though the puncture has been made according to all the rules of art, and without any fault, the scrotum should inflame and suppurate, a longitudinal incision must be made to let the matter have a free exit, and thus a hydrocele, to which it was intended to apply only the palliative treatment, is perfectly cured without the chance of relapse. Bertrandi, *Traité des Operations de Chirurgie*, p. 189.

* Practical Observations on Sclerocele, &c. 8vo.

† Cases of Diseased Bladder and Testicle, p. 51., &c. 4to. Lond. 1815.

‡ Medico-Chir, Trans. vol. ix. p. 38, &c.

albuginea.* The late Mr. Ramsden principally founded his theory upon the well-known fact, that the scrotum sometimes becomes transparent after the operation, whence he inferred, that another collection of fluid must be effused, which is subsequently removed without obliteration of the cavity of the tunica vaginalis.

That, in many instances, a considerable effusion of serum and coagulable lymph takes place within the tunica vaginalis, after the use of an injection, is a truth, which will be readily admitted by every man of experience. That such effusion may produce an appearance of transparency, and even a fluctuation, leading to an idea that the disease has returned, and the operation miscarried, is also equally certain. But it does not follow from these premises that, when the tumour is afterwards lessened by the action of the absorbents, the cavity of the tunica vaginalis will remain; an inference which ought not to be assumed, without the evidence of dissection. As Richerand has observed, "the radical cure of a hydrocele is not always effected by means of an adhesion *immediately* formed between the tunica vaginalis and the surface of the testicle. In most instances things do not happen in this manner. The irritation produced occasions an exudation of a lymphatic albuminous matter, which becoming organised betwixt the two surfaces, unites them together. This matter, which is very different from pus, is often so copious as to cause a fluctuation, and make an inexperienced surgeon believe a new effusion of water has happened within the tunica vaginalis, and that the operation has failed. In patients who have died under these circumstances, the tunica vaginalis has been found distended with flakes of albumen, which, concreting and becoming organized, forms the adhesion between the tunica vaginalis and the testicle."† These remarks are adduced, however, not with any intention of denying the possibility of radically curing a hydrocele, without obliterating the cavity of the tunica vaginalis; but only to prove, that some of the circumstances brought forward as evidence of the cure being thus accomplished, when the hydrocele has been injected, are by no means conclusive. When a spontaneous cure takes place in a child, I suppose there is usually no obliteration of the cavity in which the fluid was collected; and, probably, no such change happens when the disease is removed by external applications, unless they chance to excite inflammation.

* See Keate's Cases of Hydrocele, &c. p. 39.

† Richerand, Nosographie Chir. t. iv. p. 284, 285, edit. 4.

EXTERNAL APPLICATIONS.

That hydroceles might occasionally be cured by means of discutient applications, was a fact not unknown to the ancients. The plan is recommended by *Ætius*; and *Wiseman* *, the father of English surgery, even adduces cases in proof of its success. That it would sometimes answer might, indeed, have been anticipated from the consideration of another circumstance, adverted to by *Mr. Keate*, viz. "our frequently seeing collections of water in the tunica vaginalis disappear in consequence of some accidental cause, as a blow, the gout, fever, &c. and return no more." † The treatment, tried by *Mr. Keate*, simply consisted in applying to the tumour, three times a day, linen wet with a lotion composed of an ounce of the muriate of ammonia, dissolved in four ounces of vinegar, and a similar quantity of spirit of wine. The swelling was also supported in a bag-truss. In children, hydroceles often get well of themselves, and very frequently yield to discutient applications. Hence, in such patients, as *Mr. Wadd* has remarked, it is seldom necessary to resort to an operation. ‡ I am happy to be able to corroborate this statement by the testimony of a gentleman whose experience in the diseases of children has been for some years very extensive; I mean *Mr. M'Gregor*, surgeon to the Lock Hospital and York Military Asylum, who assures me that he has had abundant opportunity of ascertaining the fact, that, in young subjects with hydrocele, there is seldom any real occasion for an operation, as the disease may be got rid of by any local remedies calculated to excite the action of the absorbents. In his own practice, he has found fumigations of the scrotum with cinna-bar, one of the most efficient means. A boy, twelve years old, was cured of a hydrocele by exposing the swelling to the steam of vinegar, applying the lotio plumbi acetatis, and exhibiting purgatives. § Successful as this practice appears to be in children, it is very uncertain in adults; and though, in them, it is sometimes found to answer, it more frequently fails. In a part of the cases brought forward by *Mr. Keate* in favour of the method, the lotion was applied as soon as the water

* *Wiseman*, b. i. chap. 23.

† See *Keate's Cases of Hydrocele*, with *Observations on a peculiar Method of treating that Disease*; to which is subjoined a singular case of *hermia vesicæ urinariæ*, complicated with hydrocele, &c. p. 19. 8vo. Lond. 1788.

‡ *Wadd's Cases of Diseased Bladder and Testicle*, p. 54.

§ *Richter, Chir. Bibliothek*, b. ix. p. 593.

had been discharged, and when this mode is followed, I believe a cure is more likely to be the result, than when the swelling is not emptied: at all events, there is a case or two in the writings of Flajani *, tending to prove the truth of this remark. A hydrocele, which was apparently the consequence of the pressure of an ill-made truss on the spermatic cord, was cured by taking off the truss, and using resolvent lotions, and a suspensory bandage. † I know of no particular objection to a trial of external applications, except their frequent inefficacy in adult patients. Candour obliges me to add, however, that in one or two instances which have been verbally communicated to me, the patient not only lost time in the experiment, but suffered a good deal of pain from superficial inflammation of the scrotum, excited by the muriate of ammonia; an occasional inconvenience, of which, indeed, Mr. Keate himself makes mention. ‡

EXCISION OF THE SAC.

This method, which is spoken of in the writings of Albucasis, Paulus Ægineta, and Fallopius, was practised both by Saviard in France, and Douglas in England. The latter cured six patients in this manner. His plan consisted in removing a portion of the integuments from the front of the scrotum, by making two semi-oval incisions, and cutting away all the loose part of the tunica vaginalis. The exposed cavity was now filled with lint, a poultice was applied, and bleeding and other antiphlogistic means practised. This severe method of operating, which was always followed by considerable inflammation and fever, and sometimes by fatal § effects,

* In one young man, twenty-two years of age, a hydrocele was radically cured by simply puncturing it, and covering the scrotum with a compress dipped in lime-water. See *Collezione d'Osservazioni e Riflessioni di Chirurgia*, t. ii. p. 182.

† See Loder's *Chirurgisch-Medicinische Beobachtungen*, b. i. p. 168, 169.

‡ In addition to the above observations, tending to prove the possibility of dispersing hydroceles, especially in young subjects, the following facts merit notice. Morand dispersed several hydroceles by making an issue in the scrotum. Douglas did the same thing by means of an issue near the groin. Schmucker cured one hydrocele by applying the steam of vinegar night and morning, and the same fluid as a lotion at other times. Warner often cured hydroceles in children by means of purgatives and outward applications. (*Cases in Surgery*, p. 302. edit. 4.) Mohrenheim cured a hydrocele in a similar manner. In children the disease has yielded to emetics. (Richter, *Chir. Bibliothek*, b. v. p. 120.) To mercury. (Dussaussoy.) To an attack of gout. (Pott.) Richter suggests the external application of tartar emetic. *Anfangsgr.* b. vi. p. 63.

§ See Warner's *Cases in Surgery*, p. 301. edit. 4.

is at present entirely rejected from the practice of surgery in England. When the tunica vaginalis is much thickened, a few foreign practitioners yet deem its excision necessary; but, in this country, impartial experience at length declares against the necessity of the proceeding even in such a case, and an ossified state of that membrane is the only condition now allowed to require so severe a method of treatment. A specimen of such an ossification is contained in Mr. C. Bell's Museum. * Though an unqualified condemnation of the practice of excision, as it was formerly executed, is now the general sentiment, I would not wish the remark to apply to Mr. Kinder Wood's method, which has been already spoken of, and which, from the reports made to me about it, I am inclined to think, is both mild and effectual.

SETON.

Mr. Pott used to give the preference to the following method: The tumour is to be pierced, and the fluid discharged through the cannula in the common way. A seton-cannula is then to be passed through that of the trocar, until it reaches the upper part of the tunica vaginalis. This having been done, a sharp-pointed eye-probe, armed with a seton, is to be conveyed through the seton-cannula, and pushed from within outwards through that portion of the tunica vaginalis and integuments, with which the extremity of the tube is in contact. The seton is then to be drawn through the instrument, until a sufficient quantity is brought out of the upper wound. The two cannulae are next to be withdrawn, and common dressings applied to the orifices of the punctures, the ends of the seton being fixed, as may be found most convenient, with a couple of slips of adhesive plaster. A bag-truss is to be applied, the patient go to bed, and take an opiate draught. Of all the methods devised for the cure of hydrocele, none are more ingenious and effectual than the seton, and next to the treatment with an injection, it is unquestionably the mildest plan, and most deserving of recommendation.

CAUSTIC.

When this practice used to prevail, caustic potassa, with quicklime, was mostly employed, with which an eschar about half an inch broad was made along the whole front of the tumour. The treatment of hydrocele with caustic may at present be considered as entirely exploded; for, when the eschar separates, the opening seldom extends into the tunica

* Operative Surgery, vol. i. p. 207. 8vo. Lond. 1807.

vaginalis, and a cutting instrument must after all be used for discharging the fluid. Besides, in the cure of a hydrocele, the destruction of any part of the scrotum is quite unnecessary; and the operation is on the whole greatly more painful, and uncertain in its effect, than several of the other methods. Notwithstanding these serious objections, it was highly commended, and frequently practised, not many years ago, both in this country and upon the Continent. *

INCISION.

This is a method which has had several distinguished modern surgeons amongst its advocates, as the names of Richter †, Delonnes ‡, Loder §, and Callisen ||, will amply testify; and it is one of the most ancient modes of cure, having been described by Celsus. The anterior and inferior part of the tumour is to have a puncture made in it, of sufficient size to enable the operator to introduce the end of his fore-finger into the cavity of the tunica vaginalis. This he should do immediately, and before all the fluid is discharged, and the tunica vaginalis collapsed. Then, with a blunt-pointed curved bistoury, the tunica vaginalis is to be divided throughout its whole length. The wound is then to be gently dressed with lint and a common pledget. The reasons commonly urged in favour of this operation are, that it allows the operator to see the state of the tunica vaginalis and testicle, so that he is perfectly qualified to judge whether they require removal or not. But I have already stated, with respect to the thickening of the tunica vaginalis, it is a circumstance which, according to the observations of Sir J. Earle, Mr. C. Bell, and others, will not impede the cure of a hydrocele, though no excision of the diseased membrane be practised. Laying open the tumour; therefore, cannot be deemed necessary for any purpose of this kind: and, as for the supposed advantage of seeing the state of the testicle, every useful information on this point may be obtained by the feel of the part, after the fluid is let out by a simple puncture. In old large hydroceles, where the vessels of the spermatic cord are separated, and displaced over the fore-part of the bottom of the tumour, an extensive cut

* See Joseph Else's Works, 8vo. Lond. 1782. Andr. Dussaussoy, *Cure Radicale de l'Hydrocele par le Caustique*. 8vo. Lyon, 1787.

† *Medicinische und Chirurgische Bemerkungen*, b. i. p. 119.

‡ Imbert Delonnes, *Traité de l'Hydrocele*, p. 225. 8vo. Paris. 1785.

§ Loder, *Chirurgisch-Medicinische Beobachtungen*, p. 148. 8vo. Weimar, 1795.

|| Callisen, *Syst. Chir. Hodiernæ*, t. ii.

through the whole length of the tunica vaginalis must be anatomically objectionable. The severity of the operation, compared either with the cure by means of a seton, or of an injection, is also unfortunately made amends for by no evident advantage, for both the latter methods scarcely ever fail. When the cure by incision is practised, the symptoms sometimes run very high, as we may convince ourselves of, by referring to a case treated in this manner by Flajani, where violent inflammation of the scrotum, fever, general swelling, and tension of the belly, and delirium, very nearly carried off the patient.* In this same instance also, a troublesome hemorrhage from the scrotum came on about an hour after the operation, and made the removal of the dressings necessary.

TENT.

The way of effecting a radical cure of a hydrocele with a tent, consisted in making an opening into the upper and anterior part of the scrotum with a small lancet, and discharging the water. A roll of linen, or a piece of bougie, was then introduced through the wound into the tunica vaginalis, where its irritation produced inflammation, suppuration, and ultimately an obliteration of the cavity in which the fluid was collected. As this process of cure is liable to do more injury to the testis than is necessary, and is more painful and troublesome than the employment of a seton or an injection, it is at present, I believe, universally abandoned.

INJECTION.

The hydrocele is to be tapped with a trocar at its anterior and inferior part, and as soon as the fluid is entirely discharged, and the testicle is felt to be free from the solid and craggy hardness which is indicative of scirrhus, the cavity of the tunica vaginalis is to be distended to its former dimensions with an injection composed of two parts of port wine and one of water. For patients of very irritable constitutions, however, the wine should be more diluted. In speaking of the palliative cure, I took the opportunity of reminding the surgeon of the collapse of the tunica vaginalis, in proportion as the water runs out of it; a circumstance which makes that membrane apt to recede from the cannula, if this be not introduced at first well within it, and held so during the escape of the fluid. When once

* Collezione d'Osservazioni e Riflessioni di Chirurgia, t. ii. p. 160.
161.

the tube slips out, it can seldom be passed in again, owing to the aperture in the tunica vaginalis not remaining exactly opposite the puncture in the scrotum; and, for the same reason, the water, instead of readily flowing out, is liable to insinuate itself into the cellular membrane, and a more or less complete interruption of the operation ensue. But when the cannula slips out of the tunica vaginalis, at the time of attempting the radical cure with an injection, the consequences are far more serious; for if the tube cannot be replaced again, the operation must be deferred until the swelling has filled again; or, if the displacement of the cannula unfortunately be not perceived, and the injection be forced, not a drop of it will pass into the cavity of the tunica vaginalis, but the whole will be thrown into the loose cellular texture of the scrotum. Several surgeons of eminence have been known to commit this serious mistake, the general consequences of which are, sloughing of the cellular membrane, tedious and troublesome abscesses, and violent inflammation and sometimes mortification of all the integuments of the scrotum. When it is considered that the accident also produces a great deal of severe pain and fever, and much uncertainty, whether the patient, after all this suffering, will be rewarded by a permanent cure of the hydrocele, the mistake cannot fail to be regarded as one of a most disadvantageous and vexatious nature. It was from such a cause, that the whole tunica vaginalis sloughed, with part of the scrotum, in a patient operated upon by Boyer.* Another instance is mentioned by Sir J. Earle, in which the surgeon, after letting the tube slip from the tunica vaginalis, continued to force the injection, until he actually filled both sides of the scrotum. Violent inflammation and mortification of the scrotum were the consequences, leaving the testes quite bare. A very similar mistake happened only a few weeks ago, in a case where I was desired to assist at the operation; and, as in this example, I think the accident was very much promoted by the pipe of the syringe not fitting that of the trocar, inasmuch as the cause of the injection not readily entering was at first referred to that cause, I cannot too strongly recommend surgeons to be very careful always to use a well-constructed apparatus, every part of which is well adapted to the rest. These remarks are calculated to impress upon the mind of the surgical reader the necessity there is for being sure, that the cannula is well within the tunica vaginalis, before the injection is used, and, in

* Richerand, *Nosographie Chirurgicale*, t. iv. p. 284. edit. 4.

beginning, the surgeon should proceed in the gentlest and most cautious manner, attentively observing whether any resistance to the entrance of the fluid be experienced, and whether any of it regurgitate in the early stage of this part of the operation. If such resistance to the admission of the fluid be perceived, immediately followed by a return of the liquid outward, these things must either be owing to the end of the tube resting against the testis, or to its having slipped altogether out of the cavity of the tunica vaginalis. Shifting the position of the tube will at once prove, whether the difficulty be owing to the former cause; for if it be, the injection will now readily enter, without the least occasion for force. But, on the contrary, if the obstruction be not removed by altering the position of the cannula, the practitioner has strong cause for suspecting either that the tunica vaginalis, in collapsing, has slipped away from the tube, or that the latter has been inadvertently drawn more or less out of the scrotum. He must, therefore, not persist in forcing the injection into the part, but endeavour gently to push the tube into the cavity of the tunica vaginalis again, and if this cannot be effected, the attempt at a radical cure should be postponed, because in the empty state of the hydrocele, another puncture with the trocar manifestly cannot be made with due regard to the safety of the testicle. In the case which recently fell under my observation, the mistake was not discovered until it was wished to let out the injection again, when it was found that only the few drops which happened to be in the tube itself could be got out. This was one of the most copious extravasations of injection I have ever witnessed. There followed a good deal of sloughing of the cellular texture of the scrotum, with suppuration, the matter descending far along the perineum. The skin, however, did not mortify, which might be owing to the injection being only one-half of it wine. A radical cure was the result. The mistake must be very frequent; for there are hardly any of my surgical friends in London, who have not witnessed it on one or more occasions; and the occurrence is mentioned by nearly every writer. "This is an accident," says Mr. C. Bell, "which I have seen very frequently happen in the hands of dexterous surgeons. One day, while I was accompanying a celebrated surgeon to the house of a patient, on whom he was about to perform this operation, I took occasion to remark to him this danger. He said, that he could not conceive how it should happen, and that he had performed the operation thirty times, without such an accident having occur-

red. But, in performing the operation that day, the very thing happened: a large proportion of the fluid got into the cellular membrane." *

In order to avoid the foregoing accident, the most important point is to be careful to push the cannula of the trocar a full inch or more into the cavity of the tunica vaginalis at the moment of withdrawing the stilette, a thing which can always be done during the distended state of that membrane with the utmost facility. The tube being once properly introduced, the surgeon should hold it steadily within the part himself, and not entrust it to the assistant, the very act of transferring it from one person to another being attended with some risk of displacing it.

In ordinary cases, the port-wine injection is to remain in the sac about five minutes, after which, it is to be allowed to escape through the cannula; but where the constitution is known to be very irritable, or the pain in the scrotum, groin, and back, arising from the effects of the presence of the stimulating fluid, are unusually severe, half the time above specified will be sufficient. † The public are much indebted to the late Sir James Earle for the perfection, to which the mode of curing hydroceles by an injection is now brought. His apparatus was remarkably well made. The stimulating fluid was injected into the tunica vaginalis through a pipe, one end of which is made to fit the cannula of the trocar; the other, adapted to receive the neck of an elastic bottle, with a valve, or ball, in the centre of the pipe to permit the entrance, and prevent the exit of the injection. The latter contrivance was found infinitely more convenient than a stop-cock, which required a hand to turn it. If there be any objection to the valve, I think it is that it may be the means of concealing from the operator, the disposition of the fluid to regurgitate, when the end of the pipe is not within the tunica vaginalis, and an attempt is made to throw the injection into the sac.

After the injection has remained long enough in the sac, it is to be let out, particular caution being used to void the whole of it, as the continuance of a part of it behind would

* Operative Surgery, vol. i. p. 201.

† It is pretty well agreed amongst surgeons, that the sensibility evinced by the patient, is the principal circumstance by which the strength of the injection, and the duration of its application, should be regulated. Thus, if no pain be felt, though the stimulating liquid has been kept in the sac eight or ten minutes, Richter thinks it best to let out the injection, and throw in pure wine. Undiluted wine is also recommended when the hydrocele is old, has often been tapped, and the tunica vaginalis is thickened. Anfangsgr. der Wundarzn. b. vi. p. 98, 99. 8vo. Gott. 1802.

cause excessive irritation of the testis and tunica vaginalis, and perhaps ooze out into the cellular membrane, where it would excite inflammation, suppuration, and gangrene. After the operation, a piece of soap-plaster is to be applied to the puncture, and a bag-truss to the scrotum. The following morning a good deal of inflammation has generally ensued, in which circumstance the employment of poultices should commence. When the redness, pain, and swelling of the parts have a tendency to exceed the necessary degree, they must be counteracted by antiphlogistic remedies.

The cure of hydroceles by an injection, is that which is now generally preferred by all the best surgeons of Europe, as being the mildest plan, and hardly ever failing. A few instances, however, have been published, in which this method of treatment has been followed by very severe inflammation of the scrotum, abscesses, and dangerous constitutional disturbance. Nay, great irritation and a locked jaw are said to have been occasioned by the injection in one patient, whose health was previously bad, and who had, a little while before the operation, gone through a course of mercury.* That severe effects will now and then happen under the best management, must be expected by every surgeon who knows the facility with which extraordinary affections of the system, and high degrees of inflammation, are produced in irritable depraved constitutions. Nor would these evils be at all avoided by having recourse to any of the other means of effecting a radical cure, since general experience declares this to be the mildest.† Amongst others, Professor Schreger has detailed an example, in which very severe symptoms and large abscesses in the scrotum followed the injection of a hydrocele. But, without dwelling upon the possibility of some of the injection having been extravasated in this case, it may be right to observe, that the constitution of the patient here alluded to is acknowledged to have been before the operation in a very bad state, from the effects of syphilis and its treatment. Also, after the fluid had been let out, the testis and cord were found enlarged and indurated; and (what especially claims notice) the injection consisted of two ounces of undiluted Burgundy-

* See Wadd's Cases of Diseased Bladder and Testicle, p. 57.

† The well-informed surgeon Loder, who was in England, and studied under Pott, is very partial to the method of cure by incision: yet he acknowledges that the treatment with injection deserves recommendation in irritable subjects prone to inflammation, and that it is safe enough when the hydrocele is simple and uncombined with hardness of the testicle. See his *Chirurgisch-Medicinische Beobachtungen*, p. 159.

wine, which were kept in the tunica vaginalis some minutes, but how many is not specified.*

In a patient, whose extraordinary irritability of constitution is known before-hand, it is always advisable to distend the tunica vaginalis with a much weaker injection than what is commonly used. That hydroceles have been cured by simply letting out the water, and then filling the cavity with air, which is to be pressed out again, is a fact which has been familiarly known for a long while in this country. But, whether the experiment was given up on account of its uncertainty, or for other reasons, I know not. It is curious to hear, however, that this method of injecting air has been proposed and practised in Germany, as particularly eligible in cases where it is desirable that the irritation should be very moderate.† In the examples, however, published by the author referred to below, it is clear enough, (as indeed he himself confesses,) that the cure could not be fairly ascribed altogether to the introduction of the air; for a small tent was passed into the opening, and as the inflation was repeated, this little tent was taken out and reapplied as often as it became necessary to use the air-pipe: such proceedings could not fail to excite inflammation of the parts. The chief argument urged in favour of the plan is, that in no other method can the inflammation be so gradually and gently increased according as circumstances may require; an immense advantage in weak irritable constitutions.

I have heard of hydroceles being cured by injecting the sac with the fluid which has been drawn out; and Mr. McGregor lately informed me of three hydroceles which Mr. Briggs radically cured by merely distending the sac with common water. These facts, and the effect of simple inflation, are interesting, as undoubtedly there are delicate patients sometimes met with, in whom it would be highly desirable to accomplish a cure with as little irritation as possible.

CONGENITAL HYDROCELE.

Sometimes a good deal of fluid accumulates within the tunica vaginalis, while the communication between the abdomen and the cavity of that membrane remains unclosed. This case is commonly named a *congenital hydrocele*. The swelling, which is of an oblong shape, is more or less considerable and tense, according as the patient is in the erect or recumbent

* See Schreger's *Chirurgische Versuche*, b. i. p. 141—148.

† Ibid. p. 132. *Über Heilung der Hydrocele durch Lufteinblasen.*

posture. As the testis is concealed by the fluid, it cannot be plainly felt; but the spermatic cord can usually be perceived behind, and a little towards the outer side of the upper part of the tumour. When the swelling is compressed, it subsides, because the fluid then passes up into the abdomen. Sometimes, however, when the upper part of the sac is much contracted, the pressure must be applied with skill, and continued a good while before this change can be produced. According to the investigations of Professor Schreger, it appears also, that in some individuals, the occasional difficulty in pressing the fluid up into the abdomen, depends upon the direction and conformation of the neck of the sac, and not merely upon its small diameter. In one case, he found that the fluid could be compressed into the abdomen only when the tumour was inclined in a more oblique direction from within outwards; and, on dissection, it appeared that the perpendicular position of the swelling regularly occasioned an angle, or sudden turn, in the passage.* The earliest account of this species of hydrocele was drawn up by M. Viguerie, a surgeon at Toulouse, and communicated to the Academy of Surgery at Paris. If Schreger's statements be correct, it is a disease which must be much more frequent in his part of Germany than in England; for, he assures us, that numerous examinations have convinced him, that out of every eight new-born male infants, there is always, at least, one more or less affected with the complaint. In very young infants, he thinks, that the disease is mostly overlooked, or not understood, either in consequence of the swelling being mistaken for the effect of a bruise received in the birth, or of its being generally small, owing to the children being kept mostly in the recumbent posture. It is likewise a singular remark of the same writer, that this species of hydrocele should be, if not more frequent, at all events of longer continuance in Jewish children, in whom, says he, anomalies in the development of the genital organs, protracted descent of the testes, and congenital herniæ, are particularly often observed. When the disease continues beyond the first month, and nothing is done, it will sometimes remain during the whole of childhood, the adult age, and even later. In some individuals, the swelling enlarges very slowly, being for many years of inconsiderable size; while, in others, it attains a great magnitude in a short space of time.†

Although the communication between the abdomen and

* Schreger, *Chirurgische Versuche*, b. i. p. 2—6. 8vo. Nurnberg, 1811.

† Ibid. p. 7—10.

tunica vaginalis is a condition essentially appertaining to this species of hydrocele, such state is not invariably followed by the latter disease; for experience proves, that the peritoneal canal between the scrotum and belly frequently remains unclosed a considerable time after birth, without any collection of fluid taking place in the tunica vaginalis. This particularity of structure, therefore, is only to be regarded as a predisposing cause, keeping up the liability to the complaint. Hence, adults who happen to have the passage open, may first become affected with this sort of hydrocele at an advanced age. Loder describes a hydrocele which had existed two years and a half in a man forty years of age, and which, as it became larger in the erect posture, and smaller in the recumbent, must have had a communication with the cavity of the abdomen.* A very similar case also fell under the notice of Hebenstreit.†

The fact of the communication between the tunica vaginalis and abdomen sometimes remaining open, without any fluid accumulating in the scrotum, led Schreger to infer, that the water was not secreted by the peritonæum, but by the inner surface of the tunica vaginalis; an opinion, however, which becomes questionable, when the effects of the plan of treatment proposed by M. Viguerie, are considered; for a cure appears to be a frequent result of simply squeezing the fluid up into the belly, and hindering its descent again by pressure. I will not say, however, that Schreger is not right in the sentiment which he has delivered upon this point, because such pressure may possibly excite the adhesive inflammation, and thus obliterate the cavity in which the fluid was collected‡, as this author believes to be the fact. Besides the argument which he uses, that there is sometimes no hydrocele, when the upper part of the tunica vaginalis is quite pervious, he affirms, that a recovery is no more impossible, though the opening remain unshut, than a relapse, though it be obliterated.§

The treatment which M. Viguerie adopted, consisted in pressing all the fluid back into the abdomen, and keeping it there with a truss, the pad of which made close pressure upon the abdominal ring. Nature then soon obliterated the communication between the abdomen and scrotum, and the patient was radically cured. M. Viguerie has published several

* Loder, Chir. Beobacht. b. i. p. 166.

† In Bell vom Wasserb. &c. p. 23.

‡ Chirurgische Versuche, b. i. p. 18, 19.

§ Ibid. p. 23.

cases, which were treated in this way with complete success ; and Sabatier saw a boy, about six or seven years old, cured at Paris in the same manner.* Schreger conceives, that Viguerie's mode of treatment might be rendered still more certain of answering, if the patient were to wear, in addition to the truss, a suspensory bandage, wet with spirit of wine, or the lotion composed of spirit of wine, vinegar, and the muriate of ammonia.†

Viguerie's method, however, has not succeeded in the hands of every surgeon who has had occasion to try it: Desault tried it with considerable care, and, though the pressure was accurately maintained on the ring a long while, a relapse followed ; and Schreger relates two other examples, in which the practice failed.‡ Desault, not finding the above simple treatment always have the desired effect, was induced to attempt the cure with a red-wine injection. If any of the viscera protruded from the abdomen, he used to reduce them, and then tap the hydrocele in the common manner. At the same time, an assistant made pressure on the upper part of the sac, so as to shut up the communication between the tunica vaginalis and abdomen. The injection was then introduced, and allowed to remain a short time, after which it was let out, the scrotum covered with linen dipped in the injection, and a truss applied, both with a view of hindering any remains of the fluid in the tunica vaginalis from entering the abdomen, and of preventing the descent of the viscera.§ Although this practice is alleged to have been completely successful, and not to have occasioned any inflammation of the peritonæum, there can be no doubt, that, as it is a more severe mode of cure than that recommended by Viguerie, it ought to be practised only when the latter is found ineffectual. It would require also more facts, than even Desault's experience probably furnished, to justify the conclusion, that the use of an injection, when a communication exists between the tunica vaginalis and abdomen, is quite exempt from the risk of peritonitis.

Professor Schreger gives in his work the history of three forms of congenital hydrocele, which have not been described by any other writer.

1. The peculiarity of the first is, that the collection of fluid only reaches from the mouth of the peritoneal canal

* Sabatier, Médecine Opératoire, t. i. p. 504. edit. 2. Paris, 1810.

† Chirurgische Versuche, b. i. p. 26.

‡ Ib. p. 21. 22.

§ Œuvres Chirurgicales de Sault par Bichat, t. ii. p. 440—442.

down to a little above the testis, and there terminates. At that point, the process of peritonæum is closed, and consequently the excluded cavity of the tunica vaginalis contains none of the water. This case should be discriminated from the encysted hydrocele of the spermatic cord, in which disease, the fluid has no communication with the cavity of the belly, and the tumour plainly terminates in front of the ring in a spherical closed point. The ring itself is free, and the spermatic cord can be felt entering between its pillars quite unconnected with the swelling; but, the species of congenital hydrocele now in question, extends within the ring, and can be distinctly felt between its pillars. According to the investigation of the same writer, however, a hydrocele originally of this nature may afterwards assume the character of an encysted hydrocele of the cord, in consequence of the closure of the upper opening, by which it communicates with the abdomen.

2. The next form of congenital hydrocele, pointed out by Schreger, he admits does not merit this name, on the ground of a communication with the abdomen, but only inasmuch as it has its origin in the fœtus. The uppermost part of the process of peritonæum is closed as high as the pillars of the abdominal ring, and the rest of this process and the vaginal coat are filled with fluid.

3. A third undescribed variety of congenital hydrocele, Schreger says, has not its fluid immediately within the cavity of the tunica vaginalis, but in a new-formed membranous cyst, which is intimately connected to the inner surface of the process of peritonæum, which it fills up its whole length, terminating both within the ring, and above the testis, in a spherical cul-de-sac. The swelling is oblong, with its upper narrow end extending into the ring, and its lower broader part reaching down to the testis. After the patient has been long in the recumbent posture it is somewhat less prominent, but when he has been standing some time, it becomes fuller and more elastic. If it be pressed upward, it recedes a little, but immediately projects again on the pressure being discontinued. The spermatic cord can be felt underneath, or behind it. The main difference of this case from a common encysted hydrocele of the cord is, that the tumour extends into the ring, leaving between that aperture and the disease no space in which the cord can be distinguished, uncovered by the swelling.*

* Schreger, *Chirurgische Versuche*, b. i. p. 26—42. This author illustrates his descriptions with several cases and engravings. In another section

HYDROCELE OF THE SPERMATIC CORD.

In some instances, this is an œdematous affection of the whole of the cellular substance of the spermatic cord; in others, the fluid is confined to one, or more cavities, within the sheath of the spermatic vessels. The first case is termed simply *hydrocele of the spermatic cord*; the second, *encysted hydrocele* of this part.

The first complaint is not a very common one, does not cause much inconvenience, unless when very large, is usually mistaken for a varix of the spermatic cord, or an adherent omental hernia, and seldom leads the patient to do any thing else than wear a suspensory bandage.

When the disease is of a moderate size, the scrotum appears quite healthy, except that, when not corrugated, it seems rather fuller, and hangs rather lower on that side, than on the other. The testicle can be distinctly felt, below this fulness, quite unenlarged. The spermatic cord feels considerably enlarged, as if its vessels were varicose, or there existed an irreducible epiplocele. The tumour is broader at the bottom than at the top. It seems to diminish when compressed; but immediately resumes its former size, when this pressure is discontinued, and as easily in a supine as in an erect posture. There is a very trivial uneasiness, not in the swelling itself, but in the loins.

When very large, the complaint creates considerable deformity and inconvenience.

The only mode of radically curing the disease is making an incision into the tumour from the abdominal ring down to the testicle: but, unless the disease be very large and troublesome, the patient should be content with a suspensory bandage.

on what he names the "hydrocele of the peritoneal sheath of the spermatic cord, a new species of the complaint," he enters into a long discussion about the true nature of what is usually named an encysted hydrocele of the cord. The chief purport of his remarks is to prove, that the cyst is not a distinct, new-formed part, but, in reality, a portion of the peritoneal covering of the front of the cord; a question, which may not appear to the practical surgeon very important. Schreger seems unaware, that this identical form of hydrocele was noticed by Mr. Hunter in his description of the manner in which the peritoneal canal usually contracts from above downwards; his words are: "Yet, in some children this union seems not to take place regularly, being interrupted in the middle, and producing an hydrocele of the cord, which neither communicates with the abdomen, nor tunica vaginalis testis." See *Observations on Certain Parts of the Animal Economy*, p. 12. ed. 2.

ENCYSTED HYDROCELE OF THE SPERMATIC CORD.

This most frequently occupies the middle part of the cord, between the testicle and groin, and is generally of an oblong shape. It is so tense, that the fluctuation of the water within it cannot always be easily distinguished. It is perfectly circumscribed, occasions no pain, and generally presents a transparency, when a lighted candle is held behind it in a dark room. The testis and epididymis can be distinctly felt below the tumour, quite independent of it. The upper part of the cord in the groin is usually very distinguishable. As Mr. Pott observes, it undergoes no alteration from change of posture; it is not affected by coughing; nor are the functions of the alimentary canal disturbed by it.

Mr. Hey notices two forms of this disease, which are somewhat obscure. One is, when the hydrocele of the cord is situated near the abdominal ring, into which it admits of being pushed. The case, however, may be distinguished from a hernia, by the facility with which the vessels of the cord can be felt when the tumour has descended again, and the finger and thumb are pressed in between it and the ring. Another cause of mistake, pointed out by the same excellent practical writer, proceeds from the swelling sometimes extending below the testicle, in which circumstance the disease may be supposed to be a hydrocele of the tunica vaginalis. The surgeon, however, will not confound these complaints, if he only be careful to recollect that, in the hydrocele of the tunica vaginalis, the testicle, being surrounded with a fluid, cannot be felt if the tumour be much distended. But, in hydrocele of the cord, the testicle is on the outside of the cyst, and may be felt behind it.*

Infants and young persons are much more subject to this disease than adults; but it is much less commonly met with than hydrocele of the tunica vaginalis: Richerand contends, that, for one instance of encysted hydrocele of the cord, or of a collection of fluid in a hernial sac, there are on an average not less than two hundred examples in which the fluid is contained within the tunica vaginalis.† In children, the fluid may often be dispersed by aperient medicines and fomentations. If it should not yield to this treatment, a small puncture, sufficient to evacuate the fluid, commonly produces a cure. In adults, in whom the disease is generally more obstinate, it is sometimes requisite to make an incision through

* Hey's Practical Observations in Surgery, p. 558. edit. 3.

† Nosographie Chir. t. iv. p. 262. edit. 4.

the whole length of the tumour. I have seen several instances, in which a cure was effected with the red-wine injection, after the fluid had been let out by means of a very small trocar. Mr. Hey had a particular method of operating: he grasped the integuments and spermatic cord in his left hand, at the posterior part of the tumour, which he made project with the skin tightly drawn over it. He then divided the skin, and fibres of the cremaster, layers of the subjacent cellular substance, &c. by repeated gentle strokes of the knife, till he arrived at the cyst itself, which was generally quite transparent. The projection of the cyst increased, as the parts which covered it were divided; and, when it was laid bare, nearly the whole of it protruded. The cyst was then punctured with a lancet, and all that appeared perfectly transparent before the puncture, was cut off with the knife or scissors; but the posterior part of the cyst was left untouched. Mr. Hey now closed the integuments with a suture, without which they were apt to shrink back, and leave the cord projecting out of the wound. A poultice was then applied, till the inflammation following the operation had subsided.* This mode of treatment is not very dissimilar from that advised by Bertrandi; but he limited it to cases in which the tumour was ancient and large; in other instances, he preferred a seton, or tent, as the means of cure.†

CHAPTER XI.

HÆMATOCELE.

THIS signifies a swelling of the scrotum, or spermatic cord, occasioned by blood.

The disease is of five kinds, two of which have their seat in the tunica vaginalis, one within the albuginea, the fourth in the membrane investing the spermatic vessels, and the fifth in the cellular substance of the scrotum.

1. In letting out the water of a hydrocele, a vessel that will bleed a good deal may happen to be wounded; an accident sometimes immediately indicated by the fluid discharged being

* Op. cit. p. 559.

† Bertrandi *Traité des Operations de Chirurgie*, p. 188—191. 8vo. Paris, 1784.

tinged with blood. After the operation, the blood insinuates itself partly into the tunica vaginalis, and partly into the cellular substance of the scrotum, so as to form, in a very short time, a tumour nearly equal in size to the original hydrocele. In other instances, the water which flows out is but little reddened, and what has happened, is not suspected till the cannula is withdrawn, when blood gushes out of the puncture. This form of hæmatocele is more likely to happen when the hydrocele is very large, and it has been opened with a lancet.

2. Another species is when the blood is effused in consequence of the spontaneous rupture of a vessel after the operation, and it is entirely confined to the cavity of the tunica vaginalis. In this instance, the fluid of the hydrocele, at the period of its discharge, is not tinged with blood. Hæmatocele, from this latter cause, is often observed in old men who have been long afflicted with hydroceles that have been repeatedly opened.*

3. In the third kind of hæmatocele, the blood is extravasated within the tunica albuginea, from the vessels of the glandular part of the testicle. This is a case which has never fallen under my own observation.

4. The fourth arises from a rupture of a branch of the spermatic vein.

5. The fifth case is of the same nature as ordinary effusions of blood in the cellular substance of other parts of the body. Like them, it is frequently caused by blows, and it yields to similar treatment. I have sometimes known it take place to a considerable extent after lithotomy done with the gorget; and Richerand relates an example, in which a very large effusion of blood in the loose cellular membrane of the scrotum and perinæum followed the operation of castration. The scrotum has been rendered nearly five times larger than its natural size by this species of hæmatocele.† Richerand (as I conceive on insufficient grounds) rejects all the other species of hæmatocele but the last.

TREATMENT.

The two first cases may generally be cured by opening the cavity of the tunica vaginalis, removing the effused blood, and applying dry lint to the inside of the membrane. If the quantity of blood were very small, however, the effect of discutient

* Jamieson in Medical Essays of Edinburgh, vol. ii. art. 14.

† Nosographie Chir. t. iv. p. 260. edit. 4.

applications and purgatives might perhaps disperse it, and should first be tried, as they may do away all necessity for operating.

The third and fourth cases are less frequent.

The first of these arises from a morbid state of the substance of the testicle, and can only be cured by castration.

The fourth species of hæmatocele, or that arising from a rupture of the spermatic vein, is generally caused by great or sudden exertions, contusions, &c.

When the case is clearly distinguished from a hernia, attempts must be made to promote the absorption of the extravasated blood, by applying to the tumour the lotion composed of spirit of wine, vinegar, and the muriate of ammonia, or even camphorated liniments. The patient, if young, or not too much reduced, should also be bled, and, as purgatives are of essential use in promoting the absorption of effused blood, their exhibition should never be omitted. A bag-truss is to be worn, and the patient kept in bed. When, under this treatment, the swelling, instead of diminishing, increases in size, the bag-truss may be tightened, and compresses laid upon the scrotum, wet with the coldest water that can be procured.*

If the case should obstinately resist all these means, a thing which seldom happens, an incision must be made into the tumour, and the bleeding point being discovered, it should either be tied, or stopped with a dossil of lint. According to Richter†, when the hemorrhage is found to proceed from one of the trunks of the spermatic veins, castration is indispensably necessary; but, as the bleeding from the largest veins may generally be easily stopped by pressure, I should be extremely reluctant to make a patient lose a testicle, merely on account of the accidental rupture of one of its veins.

In the fifth case, or that of blood effused in the cellular membrane of the serotum, a free incision is the best practice, when the swelling is excessive, or resists discutient means; but, in other instances, it will be sufficient to keep up the scrotum with a suspensory bandage, apply camphorated liniment, or the lotio ammoniæ muriatæ, and exhibit two or three purgative draughts.

Should inflammation of the parts arise, venesection, leeches, and febrifuge medicines would be proper, and the best application would then be the saturnine lotion, or (if suppuration were unavoidable) an emollient poultice.

* Richter, Anfangsgr. der Wundarzn. b. vi. p. 134.

† Ib. p. 135.

CHAPTER XII.

DISEASES OF THE TESTICLE, SARCOCELE, &c.

SARCOCELE is a term applied to every chronic, fleshy enlargement of the testicle. Hence, not only several kinds of sarcoma affecting this body, and noticed in the chapter on that subject, acquire this name, but also some diseases of the testicle generally considered to be scrofulous: even fungus hæmatodes, scirrhus and cancer, when situated in this part, have been improperly blended with numerous other morbid affections, and comprehended under one common title, *sarcocele*. When the disease is attended with an accumulation of water in the cavity of the tunica vaginalis, it is not unfrequently named *hydro-sarcocele*.

The induration and swelling of the testicle remaining after a simple inflammation of that organ, are not usually called sarcocele, as they rarely increase, or give any pain or trouble. The swelling of the testis, also, arising in patients affected with syphilis, independently of gonorrhœa, or any disease of the urethra, is seldom of a dangerous or malignant nature; and the same remark may be made upon most indurations confined to the epididymis, which are generally much less disposed to end in a disease subversive of the natural structure of the testicle, than chronic swellings of the body of this gland. Still there are particular indurations commencing in the epididymis itself, which are liable to change into a disease that will ultimately destroy both the testicle and the patient himself, unless the parts be removed by the timely employment of the knife.*

OF THE COMMON SARCOCELE.

This disease is of the same nature as the ordinary vascular sarcoma described by Mr. Abernethy, and treated of in the first volume of this book. The testis becomes larger than natural; and this increased size, which, in some cases, is inconsiderable, in others, attains a degree, in which the part affected is as large as two fists. While the tumour is of moderate dimensions, the shape of the testis is partly retained; the

* For cases in proof of this observation, see Pott's *Chirurgical Works*, vol. ii. p. 458—461. 8vo. Lond. 1808.

swelling being oval and flattened at the sides, with its larger end turned upward and forward, and its smaller directed downward and backward. Its weight is very considerable, in comparison to its size; and it is its nature to remain a long while indolent, giving but little pain, except it be left unsupported, when from the dragging of the spermatic cord more or less annoyance is produced. The scrotum is of its natural colour, without any augmentation of its temperature, or any signs of fluctuation. At first the spermatic cord is unaffected, and of course the swelling does not extend quite up to the abdominal ring; but, after a time, the disease generally extends higher up, and the cord itself becomes enlarged. However fleshy and indolent a common sarcocele may be in its incipient stages, and even for years, the possibility of its assuming a more painful and malignant nature should never be forgotten, because it is a fact, that ought always to be allowed to weigh in considering the propriety of persevering in attempts to save the part. The species of sarcocele which is liable to change into scirrhus and cancer, generally begins in the body of the testicle, and very seldom in the epididymis and spermatic cord, which parts, however, are often subsequently affected.

SCROFULOUS DISEASE OF THE TESTICLE.

The testicle is sometimes converted into a truly scrofulous mass. It is enlarged in size; and when cut into, a whitish or yellowish coagulated matter is discovered, mixed with pus.

This complaint is not attended with so much pain and induration, as a scirrhus disorder of the testicle, nor does it produce any unfavourable state of the health.

FUNGUS HÆMATODES OF THE TESTICLE.

This incurable disease, called likewise *medullary sarcoma*, or *soft cancer* of the testicle, is by no means unfrequent, and particularly demands the earnest attention of the surgeon, not only on account of its fatal character, but also because it is a distemper very insidious in its attack, and peculiarly liable to be mistaken for a common hydrocele. It is described by Dr. Baillie under the name of the *pulpy testicle*. The testicle (says he) is sometimes much enlarged, and converted into a uniform pulpy matter, in which its natural structure is entirely lost. This sort of change has been sometimes mistaken for scirrhus, but it is very different from what is called scir-

thus in other parts of the body, and what is also found in the testicle itself.*

According to the excellent description given by Mr. Wardrop, the fungus hæmatodes of the testicle is mostly seen in youngish persons under the age of thirty. In some cases, it begins in the body of the organ, while, in others, its origin is attended with a tumour in the epididymis. The progress of the disease is very slow, and, as the swelling of the gland increases, the tumour retains an oval, or globular form, and it becomes difficult, if not impossible, to distinguish the body of the testicle and epididymis from one another. The pain of the disease is generally so trifling as to excite little alarm, and there is no inequality, nor hardness in the gland, nor any change in the structure of the scrotum. When the testicle has increased considerably in bulk, it becomes remarkable for its softness and elasticity, and produces a sensation, as if it contained fluid.† Hence, the disease has often been mistaken for hydrocele, and punctured; nay, so deceitful is the feel of the tumour, that cases have occurred, in which the surgeon was so persuaded of the presence of fluid, that he was not content with thrusting a lancet into the swelling once, but after a few days, actually repeated the same pernicious experiment.‡ As the employment of a lancet, or trocar, under the idea that the disease is a hydrocele, never fails to accelerate the progress of the complaint, the utmost care should be taken to avoid falling into so serious an error; an error, which always brings the skill and knowledge of the practitioner into suspicion both with the patient and his friends.

I know of no writer, who has pointed out the distinguishing marks of these two very different diseases so well and correctly as Mr. Wardrop. The want of transparency in the tumour (says he) is one appearance in the fungus hæmatodes of the testicle, which might be expected to lead to an accurate diagnosis between it and hydrocele; but, as there are many collections of water in the vaginal coat of a dark colour, and sometimes even of blood, and as the vaginal coat is often very much thickened, this cannot be always regarded as a diagnostic symptom. The fungus hæmatodes of the testicle, when of considerable bulk, though resembling many of the more fre-

* Baillie's *Morbid Anatomy of some of the most important Parts of the Human Body*, p. 350. 8vo. Lond. 1807.

† Wardrop, *Observations on Fungus Hæmatodes, or Soft Cancer*, p. 124—126. 8vo. Edinb. 1809.

‡ See *Practical Observations in Surgery and Morbid Anatomy*, by John Howship, p. 325. 8vo. Lond. 1816.

quent varieties of hydrocele in shape, yet, on inquiry, will not be found to have had a similar progress. In hydrocele, the water begins to collect at the bottom of the scrotum, and the testicle may generally be distinguished at the posterior part, until the tumour has acquired a very large size; whereas, in fungus hæmatodes, the disease commences in the body of the testicle, or in the epididymis, and the whole gland gradually enlarges. The tumour, too, in hydrocele, is accurately circumscribed towards the ring, whereas, in the fungus hæmatodes, there is a gradual swelling, or fulness, extending up from the testicle along the spermatic cord. This fulness is described as being very different also from the unyielding hardness of a scirrhus affection of the part. In judging of the nature of the disease, the comparative weight of the swelling, to that of an hydrocele of equal bulk, is likewise to be considered.

A fungus hæmatodes of the testicle, when large, sometimes becomes hard at some points, and soft at others, where the swelling seems as if it were about to break. As far as Mr. Wardrop's experience goes, it is not common for the scrotum to give way, and a fungus to protrude; but, if the patient live long enough, the disease may follow such a course.* When this happens, some points of the scrotum become discoloured, and more prominent than others, inflame, ulcerate, and discharge a small quantity of matter, and out of the new-formed openings the fungous mass shoots with more or less rapidity. Hemorrhages now take place from the excrescence from the slightest causes. The disease, which in its commencement was not very painful, is attended in a more advanced stage with severe pain shooting up the spermatic cord to the loins. Hectical symptoms gradually come on; the absorbents, glands in one or both groins, along the spermatic cord, at the side of the aorta and vena cava, and in various situations within the abdomen, become converted into a pulpy substance, similar to that of the testicle; and the patient at length falls a victim to a disease, which appears in most instances to be rather of a constitutional, than a local nature. In many cases, experience proves, that vestiges of the disease may be traced in a variety of other parts of the body at the same time, the kidnies, liver, brain, &c. When the fungus projects through the skin, the patient's fate is sometimes accelerated by repeated bleedings.† On examination of the tes-

* See Practical Observations in Surgery and Morbid Anatomy, by John Howship, p. 129. 8vo. Lond. 1816.

† Ibid. p. 331.

ticle after its removal from the body, its natural texture appears entirely lost, and it is found converted into a soft pulpy matter, not unlike the medullary substance of the brain.

SCIRRHOUS TESTICLE.

As Dr. Baillie observes, the testicle is often found converted into a hard mass, of a brownish colour, and generally intersected by membranes, and sometimes there are cells in the tumour, filled with a sanious fluid.* This is the truly scirrhus testicle, which is attended with great hardness, severe pains darting along the spermatic cord to the loins, and an unequal, knotty feel. The health commonly becomes impaired. To use Mr. Pott's words, sometimes the fury of the disease brooks no restraint; but, making its way through all the membranes which envelop the testicle, it either produces a large, foul, stinking, phagedenic ulcer with hard edges, or it thrusts forth a painful gleeting fungus, subject to frequent hemorrhage.† These latter states of the disease are denominated the *cancer of the testis*.

Sooner or later, the scirrhus induration extends from the epididymis upward along the spermatic cord, even within the abdominal ring. In the latter circumstance, the lymphatic glands in the loins usually become diseased; and this extension of mischief, together with the impossibility of removing the whole of the diseased cord, too frequently deprives the patient of every chance of getting well.

It is now well known, that various sarcomatous enlargements of the testicle, at first quite indolent, and exempt from pain, and every alarming complication, such as swelling and induration of the cord, tumours of the inguinal glands, and swellings within the abdominal parietes, are capable of assuming, in a very sudden manner, a malignant and cancerous tendency; and that sometimes the scirrhus induration of the cord makes rapid progress upward. When these changes have taken place, attended with severe hectic symptoms, extreme emaciation, a pallid wan face, and a tendency to anasarca, no measures which the healing art can suggest, will now avail to save either the diseased part, or the patient's life. Hence, that surgeon acts with prudence, who recommends an early extirpation of every testis that is incurably diseased, and entirely deprived of its original organization.

* Morbid Anatomy of some of the most important Parts of the Human Body, p. 352, 353, edit. 2.

† Pott's Chirurgical Works, vol. ii. p. 390. edit. by Earle, 1808.

From what I have seen of sarcocèles*, I am entirely of opinion with Mr. Pott, that the man who has the misfortune to be thus afflicted, has very little chance of getting rid of the disease by any means but extirpation; and all the time the operation is deferred, he carries about him a part not only useless, but burdensome, and which is every day liable to become worse, and unfit for such an operation.

As leaving a man with a malignantly diseased testicle, quite unassisted, to meet his lingering fate, is a very serious step; all surgeons ought to be well apprised, that every enlargement of the spermatic cord, in these cases, is not of that particular description, which amounts to a prohibition of an operation.

One enlargement of the cord is perfectly free from malignancy, and proceeds either from a varicose dilatation of the spermatic veins and arteries, or from a collection of fluid in the membrane enveloping the said vessels. In this case, the cord, though enlarged, is smooth, soft, and compressible; the whole process is loose and free, and will easily permit the fingers of an examiner to go all round it, and to distinguish the parts of which it is composed; and it is not painful when touched.

In that morbid state of the cord, in which the operation is forbidden, the part is unequally hard and knotty; the parts, of which it consists, are undistinguishably blended together: and handling it occasions pains, shooting up to the loins and back.

I should be sorry, if the foregoing observations were to deprive a single individual of the chance of avoiding a severe operation, and preserving an organ, to which in general the highest value is attached. That there are some chronic enlargements of the testicle, which may be resolved, is a truth, of which experience must have convinced the generality of surgeons. The scrofulous induration, and several other swellings of this organ, which are very imperfectly understood, I believe, may sometimes be benefited, and even entirely cured, just like some analogous affections of the breast. Hence, though I am an advocate for the early performance of castration, in cases of sarcocèle, where there is reason to suppose the disease so far advanced, that the organization of the testicle is totally destroyed, or where internal and external remedies have been tried a certain time in vain; this

* By which, I here imply diseases of the testicle, attended with subversion of its natural structure.

sentiment does not incline me to recommend the operation for other examples, in which the disease is quite recent, and no plan of treatment whatsoever has been fairly tried. What makes this remark still more worthy of attention is, the important fact, that every chronic enlargement of the testicle, though it be of long standing, does not necessarily imply an incurable change of structure in the part; for, if this were the case, the disease considered by Pott, and others, as the venereal sarcocele, would not admit of relief, which daily experience fully contradicts. This affection of the testicle is described as being independent of a gonorrhœa, or of any disease in the urethra; seldom an early symptom; and either immediately preceded, or accompanied by some other appearance plainly venereal. It has neither the inequality, nor darting pains of the scirrhus, and always gives way to a mercurial process properly conducted.* That disease of the testicle usually considered as scrofulous, may sometimes be diminished by administering internally cicuta and calomel, and applying to the scrotum lotions, or poultices, made with sea-water. Several other cases yield to a course of mercury; leeches being daily applied to the scrotum, or frictions made on the part with camphorated mercurial ointment. In every case, the diseased organ must be well supported by means of a suspensory bandage. According to the observations of Mr. Ramsden, that species of sarcocele which he has called sclerocele, admits of relief, by removing with bougies the morbid irritability of the urethra, with which he considered its origin to be frequently connected.†

We are not, therefore, to consider every chronic enlargement of the testicle as incurable: my wish has only been to impress the reader with the expediency of not wasting too much time in the trial of means which are not to be depended upon, and which, if continued immoderately long, might allow the disease to advance too far to be capable of being afterwards effectually extirpated.

FUNGUS OF THE TESTICLE.

There is a particular affection of the testicle, in which a fungus grows from the glandular substance of this body, and, in some cases, from the surface of the tunica albuginea.

* Pott's *Chirurgical Works*, vol. ii. p. 393. 8vo. Lond. 1808.

† See *Pract. Obs. on the Sclerocele, &c.* In this theory and practice of my late master, I confess, my mind never had any confidence; and the only inference I drew from his statements, was, that the employment of bougies will not always hinder a diseased testicle from getting well.

This excrescence is usually preceded by an enlargement of the testicle, in consequence of gonorrhœa, a bruise, or some species of external violence. A small abscess takes place and bursts, and, from the ulcerated opening, the fungus gradually protrudes. In some instances, the disease appears to have been accompanied with great irritability of the urethra, or strictures.*

If, when the inflammatory affection of the testicle has subsided, the substance of this body should not be much indurated or enlarged, it is a very rational practice, to endeavour to extirpate the fungus, and diseased portion of the testis, without removing the whole of this body.

The object may sometimes be fulfilled by destroying the fungus with the lapis infernalis. But, at all events, the fungus, and whatever superficial portion of the substance of the testicle is diseased, might be removed with a knife. Such an operation I once saw performed in St. Bartholomew's Hospital, by the late Sir James Earle, and the part healed up in the most favourable manner. I have also seen the fungus successfully extirpated with a ligature; a method which answered in the practice of Mr. Wadd: in one instance, however, as the fungus began to rise up again, its destruction was completed with caustic.†

Though this seems to be a judicious practice, when the organization of a considerable part of the testicle is not totally subverted by disease, and, particularly, when the fungus grows entirely from the tunica albuginea; yet, if the whole substance of the testicle were so diseased, that the part would still be an useless and troublesome mass, though the fungus were removed, the surgeon ought undoubtedly to perform castration. A surgeon is not however hastily to advise this operation in every instance of fungus of the testicle, attended with swelling and induration of the part. Both the cases recorded by Mr. Wadd were complicated with induration and enlargement of the testicle: yet, after the fungi had been removed, and the irritability and strictures in the urethra cured with bougies, the sarcocoele underwent in one case material amendment, and, in the other, the enlargement, after being considerably reduced during the use of bougies, was entirely removed with the aid of mercurial friction.

An interesting paper on this disease, illustrated by cases, has been published by Mr. Lawrence; and as it conveys an

* Wadd's Cases of Diseased Bladder and Testicle, p. 45 and 47.

† Op. et loc. cit.

accurate idea of the real nature of the case, I would recommend it to the attention of every practitioner.* In the best modern works published abroad, every disease of the testicle exhibiting the appearance of a fungus, is indiscriminately condemned to the severe proceeding of castration; and English surgeons have often advised the same practice, in consequence of not understanding the true character of the complaint. This disease, however, must not be confounded with other fungi, which sometimes arise from the testicle, in cases of cancer and medullary sarcoma of this organ, and which, if the cord be but little affected, the glands and viscera not obviously diseased, and the health not too far gone, require castration, as the only possible, and yet uncertain means of relief.

HYDROCELES, WITH DISEASED TUNICA VAGINALIS, LIABLE TO BE MISTAKEN FOR SARCOCELES.

It frequently happens, that the tunica vaginalis becomes very much thickened, indurated, and even cartilaginous, at the same time that its cavity is filled with fluid. Schmucker has seen hydroceles, which felt as hard as a sarcocèle; and Saviard relates, that they are sometimes attended with the hardness of horn. The feel of the tumour is very apt to deceive the surgeon, and to make him suppose the case to be a hydro-sarcocèle, while, in fact, the testis itself is perfectly sound. Forestus mentions a patient, who had an indurated swelling of the testis, distending the scrotum, like a scirrhus: for five years it continued to get larger; and every surgeon, who saw it, regarded it as a sarcocèle. At length, under the use of emollient applications, it became softer, and burst, when a large quantity of water was discharged, and the swelling of the scrotum subsided. Here was an instance of hydrocele, probably attended with a thickened tunica vaginalis; a disease which might have been cured much sooner, had it not been for the mistake in the diagnosis. I have seen several preparations of this disease in anatomical museums, and, in general, the parts had been injudiciously removed by castration. What makes a mistake of this kind still more likely to happen, is the circumstance of a hydrocele sometimes deviating from its usual character by being attended with pain. A very judicious and experienced surgeon assures us, that he has seen instances, where, from the enlargement and the painful sensations of the part, it had

* See Edinburgh Medical and Surgical Journal, vol. iv. p. 257.

been thought advisable to extirpate the testis, on presumption of that being the part aggrieved; but, upon making an incision through the scrotum and tunica vaginalis, a quantity of lymph suddenly gushed out; the testis presented itself of its natural size and appearance: thus, the nature of the disease was accidentally manifested, and a cure fortunately effected without the operation of castration. Hence, where the disease is complicated, and doubtful, a puncture should always be made into the tumour, just before proceeding to remove the testis; an experiment that will give but very little pain, and sometimes save the patient from castration; while the latter operation, if found the only means of cure, need not be delayed on account of the previous step, which has been taken as a measure of precaution.*

A hydrocele, with a considerably thickened tunica vaginalis, is a case, for which, as I have related in the chapter on hydrocele, the radical cure by incision is yet regarded by some authors as the most eligible; because the surgeon is thereby enabled to cut away the hardened tunica vaginalis, and to ascertain, with his own eyes, the actual state of the testicle. I have explained, however, that the necessity of cutting away the thickened tunica vaginalis is not generally admitted by the surgeons in England. Mr. B. Bell positively rejects the doctrine; and the late Sir James Earle has adduced cases, which appear to be fair proofs, that hydroceles may be generally cured by an injection, though the tunica vaginalis be a good deal thickened. Nay, Desault goes further, for he questions the accuracy of the common advice never to attempt a radical cure with the injection, when the testis is enlarged: on the contrary, he urges as a maxim in practice, that those incipient swellings of the testis, in which this organ has not yet acquired the weight which is characteristic of a scirrhus, far from being an impediment to the operation for the hydrocele by injection, are cases which particularly require such treatment, as the means of curing at once both the disease of the tunica vaginalis, and of the testicle. His remarks are corroborated by several interesting cases, in which the practice was tried with success. Desault, at the same time, cautions surgeons against making a trial of this plan, when the testis is scirrhus, and in the instances in which he himself adopted the plan, though the testis was considerably enlarged, it was not indurated; a circumstance demanding especial attention.†

* See Warner's Cases in Surgery, p. 291. edit. 4.

† See Œuvres Chirurgicales de Desault par Bichat, t. ii. p. 443—448.

SARCOMATOUS THICKENING OF THE SCROTUM.

Another disease, liable to be confounded with sarcocoele, is a great and sometimes an enormous thickening of the scrotum itself. This case is more frequently met with in warm, than cold, or temperate countries; but it has been seen both in this country and in France.* Though the scrotum may attain a magnitude which is truly surprising, the testes, concealed in the mass of new-formed matter, remain perfectly sound; and the principal grievances depend upon the manner in which the patient's fitness for every active employ, and even his capability of walking, riding, and taking exercise, are destroyed by an enormous swelling, which sometimes weighs nearly a hundred pounds. The only mode of relief consists in cutting the diseased scrotum away, in doing which, the operator is to avoid injuring the spermatic cord and testicles.

CHAPTER XIII.

CASTRATION.

IN some cases of sarcocoele, the performance of the operation is optional; in some, absolutely and immediately necessary; in others, altogether unfit to be attempted, as presenting no chance either of temporary or permanent advantage.

When the plans of treatment which I have spoken of, as meriting trial in cases of sarcocoele, are found to be ineffectual, the surgeon should generally have recourse to the operation, because the patient will thereby be freed, not only from the inconveniences arising from the magnitude and weight of the tumour, but also from the danger of its suddenly changing into a malignant form of disease. It is true, the records of surgery furnish us with many instances, in which a sarcocoele has continued quiet and stationary the whole of the patient's life, whence it might be inferred, that, if the preceding advice were followed, the operation would often be done unnecessarily, and

* See the Case of M. Delacroix in Richerand's *Nosographie Chir.* t. iv. p. 315. edit. 4.

a testis removed which would never occasion serious trouble. But, in opposition to this consideration, it should be remembered, that as an irrecoverably diseased testis is a perfectly useless mass, its removal subjects the patient to no important loss, while it delivers him from all the inconvenience occasioned by the size and weight of the swelling; and that, as it is never possible to know before-hand how long the disease will remain quiet and stationary, the operation is advisable on the ground of its freeing the patient from every apprehension and risk of an unfavourable change. Richter, I think, was right in not acceding to the opinion of Mr. Samuel Sharp, who was inclined to defer operating until the swelling had begun to exhibit signs of malignancy; for permanent success is more frequently obtained when the tumour is what is called benign; and the patient may not always be within the reach of the best surgical advice, when the disease begins to increase and alter for the worse; a reflection of much consequence, when it is recollected that such unfavourable change is often quite sudden and surprisingly rapid in its progress.

It must be acknowledged, however, that there are some cases in which the operation may be safely postponed; as, for instance, when the disease is the consequence of a recent inflammation of the testis, or, when it is of that kind which Pott and some other writers denominate (with what accuracy I will not pretend to say) the *venereal sarcocoele*. The *scrofulous sarcocoele* is also another form of the complaint little apt to degenerate into a disease, which has itself much effect upon the health, or any great tendency either to become actively painful, or suddenly to extend far up the cord, and render castration unavailing. This sarcocoele is itself only a symptom, or effect, of a specific constitutional disease, for the relief of which the removal of the testis can never do any material good, except inasmuch as the part may sometimes contribute in a secondary manner to the impairment of the health, by causing, more or less, mental anxiety, trouble, pain, and confinement. Unfortunately, however, when there are no other manifest traces of scrofula present, the diagnosis of this kind of sarcocoele is not always sufficiently plain in practice; and, frequently amidst the uncertainty of its truly indolent character, a perpetual alarm is felt lest it undergo any sudden unfavourable change. With respect to sarcocoeles in general, I may join Richter * in asserting, that, when the swelling is small, the hardness not very great, and the disorder has pro-

* Anfangsgr. b. vi. p. 146.

ceeded from an external cause, the operation should not be hastened; and in every case where it is advisable to defer the removal of the part, the inconvenience produced by its size and weight may be considerably lessened by the use of a bag-truss.

The operation can only be expected to succeed when the disease of the testis is entirely local; and hence, it should never be practised when the constitution, or any of the viscera, appear to participate in a similar affection to that situated in the part about to be removed. Thus, in fungus hæmatodes of the testis, where the disease is rarely, perhaps never, limited to this organ, castration is often contraindicated on account of the obvious inutility of removing one part of the distemper, while more than enough to destroy the patient must still be left behind, in situations quite inaccessible to the hand or knife of the surgeon. The general account of this destructive disease, contained in the first volume of the present work, renders it unnecessary here to enter into any recapitulation concerning the manner in which it commonly invades numerous parts together, the testes, absorbent glands in the course of the great vessels, the kidneys, liver, lungs, and even the brain and its membranes. How useless any attempt to relieve the patient by castration must be, when the symptoms render it certain, that the disease has extended to the glands and viscera, is indeed a fact too evident to require any comment. But, notwithstanding the correctness of these generally received doctrines, I would not presume absolutely to forbid the operation, though the case were fungus hæmatodes, provided the general appearance of the patient were healthy, without any manifest signs of disease in the glands, or viscera. I have never known, however, a lasting recovery follow the removal of a testis affected with fungus hæmatodes, though the patient at the time of the operation appeared to be in other respects healthy. An example, in which a testis thus diseased was removed from a gentleman in whom no other vestiges of this or any other complaint could be traced before the operation, was not long ago communicated to me by my friend Mr. Lawrence, who was himself the operator, and whose examination of the part after its removal, left him convinced that the disease was a true fungus hæmatodes. Here the wound healed up very well; but the patient was soon afterwards carried off by the effects of disease in his chest.

With respect to what is termed the scrofulous sarcocele, it would also be condemned as unfit for the operation by the maxims already premised, because here the whole constitution must be supposed to be unsound. Yet I believe this case must

often be an exception to the rule delivered, of not resorting to castration, unless the disease be local, and capable of entire removal. A scrofulous sarcocele, though no doubt complicated with a constitution prone to evince other effects of that disease, is sometimes unaccompanied with any other discoverable defect, or alteration of structure in other parts of the body. In this circumstance, if the disease of the testis be a source of grievance, castration should be performed; for experience fully proves, that the wound heals up very favourably after the removal of a scrofulous part, and there is no certainty, that any scrofulous disease will afterwards show itself in other organs. If it should not, the patient will be permanently cured; and if it should, the operation itself will have no share in contributing to the fresh attack, which may also be both more tolerable and curable than the sarcocele. In short, a scrofulous testis, when attended with great annoyance and inconvenience, (which it sometimes is not, on account of its indolence,) is circumstanced, with respect to castration, exactly as a scrofulous disease of a joint is with regard to amputation.

In considering the propriety of castration in cases of sarcocele, nothing can be wiser than the general maxim not to employ the knife, if there be any traces of disease in the viscera; and therefore it may be inferred, that the operation will not answer when the patient has very frequent attacks of colic pains, a pallid leaden-coloured countenance, indigestion, loss of appetite, frequent purging, a hard belly, or any distinct and separate indurations about the abdomen. In cases of fungus hæmatodes, or soft cancer of the testis, the kidneys are particularly often found to partake of the disease; and hence, the prudence of always making careful enquiry into the state of those organs before venturing to propose the operation. It is to be recollected, however, that the weight of the enlarged testis frequently produces in the loins extremely painful sensations, which might be mistaken for symptoms of diseased kidneys, if the difference were not indicated by the pain always diminishing, when the scrotum is well supported in a bag-truss, or the patient keeps himself in the recumbent posture. In such cases, the state of the urinary secretion would also afford useful light.

Sometimes there are swollen glands in the groin, or near the abdominal ring, and such tumours are highly unfavourable omens whenever the disease of the testis consists of any species of sarcoma, characterized by malignancy and disposition to extend to other organs.

In cases of sarcocele, attention should also be paid to the

state of the thoracic viscera; for experience proves, that various complaints of the chest frequently precede or follow the origin of a sarcocele, and seem to have a connection with it. In fact, in cases of soft cancer of the testis, the structure of the lungs is often found interspersed with pulpy, medullary tumours, the fatal nature of which is proved by the dissection of the very patient in which this morbid appearance is seen. Hence, when the patient has a constant dry cough, shortness of breath, and irregular pain in the chest, and especially when these symptoms attend a fungus hæmatodes testis, the operation is inadvisable.* The success of castration very much depends upon the state of the spermatic cord; for here it is a point of the first-rate importance to remove every particle of the disease—every thing which appears unsound and indurated. This can easily be accomplished when the disease is confined to the testis and epididymis, the cord being unaffected. But when, as often happens, the latter part is in the same state as the testis, hardened and enlarged, the operation is improper. If the disease of the cord, however, were not to extend quite up to the ring, and its upper portion were still sound, it would yet be practicable to remove all the parts affected by cutting the cord through where it is quite healthy, and the operation be justifiable. But, it is not to be denied, that, in such a case, the event is subject to great uncertainty, not so much on account of the commonly feared danger of cutting the cord through near the ring, as because the extension of the disease up the cord is always a ground for apprehending, that the complaint may not now be altogether local.

However, it is only when the cord is truly scirrhus, that is to say, thickened, hardened, knotty, and painful, that it becomes an impediment to the operation; and, when its enlargement is owing merely to a varicose dilatation of the vessels; or an effusion of fluid in the cellular membrane of the part, the circumstance should not prohibit the use of the knife. Both these last states of the spermatic cord are noticed in the preceding chapter, and may always be distinguished from the scirrhus alteration of the part by their greater softness, and their diminishing when the patient keeps himself in a horizontal position. It is probably owing to these varicose and anasaruous enlargements of the cord not having been duly discriminated from a scirrhus disease of it †, that ob-

* Richter, Anfangsgr. b. vi. p. 147.

† Richter, vol. cit. p. 150.

servations have been published with a view of proving, that castration may be sometimes safely and effectually done, though the cord be in a scirrhus state up to the ring.*

According to a modern writer, the circumstance of the scrotum being diseased in the case of a scirrhus testicle, is nearly as unfavourable to the success of the operation, as disease of the cord †, the distemper sometimes recurring in the skin. However, there is this difference, that we always have it in our power to cut away every part of the scrotum which may be affected, while in the case of scirrhus affection of the cord, it is sometimes impossible to follow the disorder to its highest point.

Castration is one of the most simple, and yet one of the most painful operations in surgery, especially when practised according to the old method, in which it was the custom to include in the ligature all the vessels and nerves of the spermatic cord. At the moment of doing this, the patient was put to excruciating torture; such suffering, indeed, as few could endure without complaint, however great their fortitude might be. ‡

In the removal of a diseased testicle, the first thing is the incision through the integuments: it should commence a little above the place where the operator purposes to divide the spermatic cord, and be continued down nearly to the bottom of the scrotum. There is an advantage indeed in letting the cut extend quite down to this point, because this free division of the skin will afterwards tend in a very essential manner to prevent those lodgments of matter, which often seriously retard the cure. The first incision through the integuments will of course divide some of the branches of the external pudendal artery, which arise from the crural, and if they bleed profusely, the best plan is to secure them at once with small silk ligatures, the ends of which may be cut short, in the manner practised by M. Roux.§ The second object is to expose and detach the spermatic cord from the surrounding fat and cellular mem-

* Bingert, Schmucker's Chir. Vermischte Schriften 1 Theil.

† C. Bell, Operative Surgery, vol. i. p. 223.

‡ Le Dran appears to have entertained a just aversion to this painful and unnecessary plan: "Of the several parts of the cord, (says he,) none but the artery will bleed; why then should the cremaster muscle, the vas deferens, and the nerve be tied with it? We are sensible, that convulsive motions have ensued from this method of making the ligature upon them all." Operations in Surgery, p. 147. transl. by Gataker, edit. 2.

§ See Sketches of the Medical Schools of Paris, by John Cross, p. 141. 8vo. Lond. 1815.

brane, which may be easily done by making a short incision on each side of it at the point where it is intended to divide it, and then having raised it a little up, continuing the dissection of it from the subjacent parts. When its detachment is sufficiently completed to allow it to be conveniently taken hold of, and lifted up, between the thumb and fore-finger of the operator's left-hand, this second step of the operation is accomplished. It is a business which should never be done in a hasty and slovenly way; for it is possible for a portion of omentum and a hernial sac to put on somewhat the appearance of thickened cellular membrane, in which circumstance a careless surgeon would be apt to cut the protruded parts in the dissection, or even divide the sac at the time of dividing the cord; an accident which has really happened.* The third object is the division of the cord; a most important part of the operation. The chief caution to be observed here is to make the incision through the part higher than the extension of the disease; for, if this be neglected, the patient will in all probability derive no effectual relief from the operation, and the wound will either not heal up at all, or if it heal at first, will soon break out again. The way of proceeding also in this part of the business is different with different surgeons. Some operators, previously to cutting the cord through, pass a ligature under it with an aneurism-needle, tie it with great firmness; and, through an immoderate apprehension of bleeding, spare neither the nerves, the vas deferens, nor the cremaster. The cord is then divided below the knot of the ligature with a curved bistoury. This is the old method of operating; a method productive of the greatest agony to the patient, and now happily rejected by every humane and skilful surgeon. Others make a slight deviation from the foregoing mode of tying the whole cord, and, aware of the inutility and pain of including the vas deferens in the ligature, and of the facility with which this vessel can be distinguished at the back of the cord by reason of its firm feel, they pass the ligature between it and the rest of the cord, over the front of which the knot is made. In the greater number of instances in which I saw castration done at St. Bartholomew's hospital in the course of my apprenticeship there, the last method was selected; and though it is a degree better than the abomin-

* "After the operation was completed, and the wound dressed, the patient being seized with a fit of coughing, to the astonishment and dismay of the surgeon, the dressings were forced off by the protrusion of several convolutions of small intestines."

able practice of surrounding the whole cord with a ligature, it cannot be said to be deserving of imitation; for the agony created by the inclusion of all the spermatic nerves, is not only severe, but absolutely unnecessary in a proceeding, the sole aim of which should be the security of the patient from hemorrhage. A far better plan is to apply no ligature in any way to the spermatic cord previously to its division; but to hold the part between the left thumb and fore-finger, just above the point where it is to be cut through, which is to be done as near to the diseased testicle as the healthy state of the cord indicates. The surgeon may then either imitate Mr. Bromfield, and deliver that extremity of the spermatic cord, which is separated from the testicle, to an assistant, who is to press it between his finger and thumb to prevent any hemorrhage, until the diseased testicle is removed from the scrotum, and an opportunity is given to take up the spermatic arteries with the forceps or tenaculum, as separately as possible from the nerves*; or the still better plan, adopted by Desault, may be pursued, which consisted in dividing the cord in the preceding manner, and then holding the upper end of it between the thumb and fore-finger of his left-hand, while with the forceps or tenaculum in his right-hand he immediately proceeded to take up the mouths of the spermatic arteries, and afterwards continued the dissection of the diseased testis from the scrotum.† During the last ten years, the preceding mode of operating has been very frequently practised in St. Bartholomew's hospital, and as far as my opportunities of observation go, it is perfectly safe and easy. Besides the spermatic arteries, the artery of the vas deferens must be sought for, and if it bleed much, have a fine silk ligature put round it. Desault's method I conceive to be the best, because if the upper portion of the cord should happen to be short, the attempt to transfer it to the hand of the assistant would be attended with some risk of its slipping away, and retracting within the abdominal ring, before the arteries were secured. But, when the surgeon holds it steadily between the thumb and fore-finger of his left-hand, until he has taken up the mouths of the bleeding vessels, no chance of its premature retraction is incurred. The fear of such an accident has had a great deal of influence over the conduct of many surgeons in this part of the operation, and their alarm has been increased by Mr. Benjamin Bell's having seen the

* W. Bromfield, *Chirurgical Observations and Cases*, vol. ii. p. 336. 8vo. Lond. 1773.

† *Œuvres Chir. de Desault*, par Bichat, tom. ii. p. 451.

thing happen twice in his practice, when both the patients were lost by hemorrhage. But had the operator in these unfortunate examples been careful to take firm hold of the upper portion of the cord, before he ventured to divide it, the retraction could not have happened; and, when it did happen in consequence of this neglect, had he had discernment enough to know what ought then to have been done, neither of his patients would have fallen a victim to bleeding. In short, had he considered the course which the cord takes obliquely upward and outward, it would have been easy for him to have followed the bleeding part with perfect safety, even to the origin of the cremaster muscle, which pulls it up.* It must be obvious, that the retraction of the upper portion of the cord within the ring must be more likely to happen, when the extension of the disease upward obliges the surgeon to divide the part higher up, than will well allow the retraction to be securely prevented by the thumb and fore-finger of the left-hand. In cases of this description, it has been proposed to avert the accident, by separating the cord into two fasciculi, and with the aid of a needle, putting a double ligature betwixt them, before the part is cut through. The design of this ligature is to draw down the cord, while the surgeon is taking up the mouths of the vessels; or, if he cannot thus stop the hemorrhage, one portion of the double ligature is recommended to be tied over the front, and the other over the posterior part, of the cord.† The goodness of this mode of proceeding may, I think, be questioned; for, the patient is put to the pain of having a large needle and double ligature passed through the spermatic cord, first, in order to hinder its retraction, a thing which can be certainly prevented in another better way, as Mr. C. Bell himself allows; and secondly, in order to be able to tie the two fasciculi of the cord entirely, if the mouths of the bleeding arteries cannot be separately secured with the forceps or tenaculum. But, I would enquire, why are we, particularly when the cord is cut high up, to expect such a multiplicity of bleeding vessels, as will defeat all attempts to take them up separately? And why, (supposing what is admitted,) when there is a preferable way of hindering the cord from slipping up into the ring, should we run a needle and double ligature through this part when it is to be cut through high up, and not when the division is to be made low down? The other plan, which is

* See *Operative Surgery*, by C. Bell, vol. i. p. 229.

† C. Bell, vol. cit. p. 228.

acknowledged to be best, consists in raising the exposed cord by passing under it the left fore-finger, and then, instead of cutting the part through at once, leaving the posterior third of it undivided. This first incision will have divided the principal artery and its branches, which are to be taken up singly, while the weight of the testis hinders the part from retracting. Then the vas deferens is to be cut, and, if its artery be not large enough to require a ligature, the rest of the cord is to be divided.*

Desault's mode of operating, when the disease of the spermatic cord reaches high up †, appears to me, in every respect, worthy of imitation. He was perfectly aware, that, in cases of sarcocele, the weight of the testicle draws the cord further out of the abdominal ring than is natural, and that when that process is enlarged and indurated a good way upward, the sound portion of it situated at or near the ring, was originally placed far within that aperture. Hence, as soon as the weight of the testis is taken off, a considerable retraction of the cord instantly follows, and the end of the healthy portion of it slips immediately into the ring. But the genius and courage of an experienced and skilful operator, like Desault, enabled him to surmount every difficulty. When the spermatic cord was diseased high up, he varied his mode of operating, and, instead of dividing the cord, before he had separated the testis from its loose connection with the scrotum, he first completed the dissection of the diseased mass, and secured whatever vessels required ligatures in the cavity of the scrotum. He then very gently drew the spermatic cord a little further out of the ring, until he had enough to take secure hold of with his left thumb and fore-finger, above the high point where the disease made it absolutely necessary to cut it through. Lastly, the operation was finished by dividing the cord, and taking up its arteries with the tenaculum, or forceps; the surgeon holding the extremity of the cord himself with the left fore-finger and thumb, while his right-hand was employed in raising the mouths of the vessels, in order that an assistant might tie them with small ligatures.‡

* C. Bell, vol. cit., p. 225.

† Le Dran's method was very similar to that of Desault; but with this difference, the latter only operated when the disease of the cord manifestly terminated below the ring; the former was more venturesome, for when the distemper proceeded quite up to this aperture, he drew the cord outward, and holding it between his finger and thumb, divided it as high as he safely could, yet without being sure whether the disease did not reach still further up.

‡ See *Œuvres Chir. de Desault*, par Bichat, t. ii. p. 454, 455. As one of the chief reasons for avoiding the ligature of the whole cord, is to save the

But, let us suppose a case, like that which Sir Everard Home speaks of, where the bleeding vessels are so numerous that they cannot all be tied separately, and the whole cord must be included in a ligature. Here the surgeon would still not be precluded from doing so, if it were absolutely necessary, though he had not, by way of precaution, passed a double ligature through the cord. The simple plan would then be to take hold of the extremity of this process with the tenaculum, so as to hinder its retraction, and apply a tight ligature round it.

That part of the operation which has for its object the taking of the diseased testicle out of the scrotum, whether it precede or follow the division of the spermatic cord, is extremely simple.

It merely consists in dividing the loose cellular substance which connects the testicle with the inside of the scrotum; and in performing this easy task, it is proper to incline the edge of the knife towards the tumour, which, after the division of the cord, may be considered as dead, and destitute of sensation.

When the diseased testicle is very much enlarged, it is reckoned advantageous to remove a part of the distended scrotum, because a considerable quantity of loose flabby skin makes it difficult to put the edges of incision evenly together, and is apt to serve as a lodgment for matter.* The manner of executing this object consists in including the portion of the scrotum that is to be taken away in two elliptical incisions, the length and interspace of which must be regulated by the magnitude of the swelling. Then the spermatic cord having been divided, and the arteries secured, the diseased organ is

patient from the severe agony caused by that proceeding, the subject deserves the particular attention of the humane and skilful surgeon, because doubts have been started as to the practicability of taking up the spermatic arteries and tying them, without including some branches of the nerves. "Les nerfs," says Bertrandi, "sont tellement entrelacés et confondus avec les vaisseaux, et sont d'ailleurs si fins, que le chirurgien ne peut jamais se promettre de les separer tous; ce qui est très difficile à faire, même sur le cadavre." Although this excellent surgeon acknowledges the ease with which the vas deferens may be left out of the ligature, he seems unaware, that tying this vessel is painful, and therefore does not condemn it. *Opérations de Chirurg.* p. 207. But it is not absolutely necessary, to make the above plan commendable, that every nerve be left out, but only as many as is possible, care being taken to draw out the extremity of each bleeding vessel with the forceps, or tenaculum, well and distinctly before it is tied. In cases of sarcocele this is more easy, as the arteries are generally enlarged.

* See Sharp's *Treatise of the Operations*, p. 51. edit. 3; Bertrandi, *Traité des Opérations de Chirurgie*, p. 209. Paris, 1784.

to be dissected out, the incisions being extended on each side from the elliptical cuts already made.

Also when a part of the scrotum is ulcerated, thickened, or adherent to the testis, two semilunar, or elliptical incisions are to be made, which meet together above and below, and include the diseased part of the skin, which is not to be separated from the swelling, but taken away with it.

When the sarcocele is very large, it may lie so close to the sound testis and the penis, that, if attention be not paid to the circumstance, and the knife be too freely used, both these parts may be injured. Sometimes, the enlarged testis approaches very near the urethra, and without care this passage may actually be wounded in the detachment of the tumour from its surrounding connections. When the swelling is of considerable size, it presses closely against the septum scroti, which part is then very liable to be wounded, and the tunica vaginalis of the sound testicle opened; an accident, which may produce a good deal of inflammation, and therefore ought to be attentively avoided.* Former surgeons had great apprehension of wounding the septum scroti, and the common warning, vociferated by the timid assistants in the operation, used to be "take care of the septum scroti:" but the truth is, if it were not for the chance of laying open the opposite tunica vaginalis, and doing mischief to the sound testicle at the same time, a wound of that part, which is merely condensed cellular substance, would be of trivial importance.

There is no surer way of avoiding the foregoing inconveniences, than being particularly attentive, in the dissection of the diseased testis out of the scrotum, always to incline the edge of the scalpel towards the swelling; a method which was invariably followed by Desault, because when the trunks of the spermatic nerves had been divided together with the rest of the cord, the inclination of the knife towards the diseased testis very properly appeared to him the least painful mode of proceeding.

As far as my own experience reaches, the most troublesome bleedings which happen after castration, proceed not from the spermatic arteries, but from the vessels within the scrotum. Hence, I cannot too urgently recommend the surgeon to tie every considerable artery of the scrotum as soon as it is cut †;

* See Richter's *Anfangsgr. der Wundarzn.* b. vi. p. 162.

† Desault, *Œuvres Chir.* t. ii. p. 451. This eminent operator regularly adopted the method for another reason, which was, that it prevented all obscurity as to the parts which he afterwards cut, the wound being free from blood.

for, if this plan be not adopted, the vessels quickly retract amongst the loose cellular texture of the part*, and though they will bleed again largely soon after the closure of the wound, they stop for a time just when the separation of the testis is completed, and baffle the utmost endeavours of the surgeon to find them. In particular, the artery of the septum scroti, which is much larger than natural in cases of sarcocele†, and often of greater size than the spermatic artery itself‡, will generally require a ligature. The ligatures here used should be made of fine dentist's silk, and cut short after their application, as the wound after castration always suppurates more or less, and the small fragments of silk contained in it constantly come away with the discharge, without the slightest inconvenience.

The operation being finished, the last business is to dress the wound. In this country, it has been the practice, ever since the time of Mr. Pott, to endeavour to heal as much of the wound as possible by the first intention. With this view, the edges of the incision are brought together, either with strips of adhesive plaster alone, or with these, assisted by one or two sutures. A pledget is then to be applied over the wound, and the contact of the parts further promoted by laying suitable compresses over each side of the incision, and supporting the whole with a T bandage. It must be acknowledged, that union by the first intention is here attempted under very unfavourable circumstances, as it is difficult to maintain the parts in exact contact, and the scrotum, deprived of the enlarged testis, forms a cavity, in which it is hardly practicable to hinder suppuration. Some of the modern French surgeons are inclined, therefore, to deny the advantage of the above mode of dressing the wound, and in Paris, the old plan of filling the scrotum with charpie, and letting the parts suppurate and granulate, is still very commonly adopted. § It is true, complete union by the first intention, is seldom or never accomplished, yet, by attempting it, the wound is much diminished, and the cure is rarely delayed later than three or four weeks; whereas the wound, when stuffed with lint, is usually not healed in less than seven or eight weeks. ||

* Dict. des Sciences Med. t. iv. p. 274.

† Petit, Traité des Mal. Chir. t. ii. p. 524.

‡ Flajani, Collezione d'Osserv. t. ii. p. 151.

§ Roux, Parallèle de la Chirurgie Angloise avec la Chirurgie Française, p. 120, &c. 8vo. Paris, 1815.

|| J. Cross, Sketches of the Medical Schools of Paris, &c. p. 144.

Sometimes, after the patient is put to bed, a hemorrhage takes place; and, frequently when the wound is opened, no particular bleeding point can be discovered. I have generally found the application of cold water to the scrotum, by means of wet linen, placed over the adhesive plaster, the best way of checking this kind of hemorrhage. Should this plan be unavailing, however, as sometimes is the case, the dressings must be taken off, and the bleeding vessel looked for, and tied. Such hemorrhage from the arteries of the scrotum may proceed to a very hurtful, and even dangerous degree, without being suspected; for, the blood flows out of the lower angle of the wound, over the patient's thigh, into his bed, while the outward dressings are perfectly dry and unstained. During the first twenty-four hours after the operation, therefore, the part of the bed under the scrotum should be from time to time felt and examined, in order that no concealed hemorrhage may be allowed to continue. *

When very severe inflammation follows castration, venesection, leeches, and other antiphlogistic remedies are indicated; while severe affections of the nervous system, great pain in the wound, spasms of the abdomen, restlessness, &c. require the use of opium and emollient poultices to the part. Tetanus, retention of urine, convulsions, incessant vomiting, tension and swelling of the belly, peritonitis, abscesses in the course of the cord very far up, delirium, incurable fits of epilepsy, &c. were more common after castration in former times, when it was the custom to include the whole of the spermatoc cord in one ligature.† Possibly, in a few examples, the alleged evils might not depend immediately upon this mode of tying the cord, because the symptoms sometimes first came on after the separation of the ligature‡; and there is no reason why this operation should not on other accounts be sometimes followed by tetanus, and other bad consequences, just like the generality of other severe operations. But, as the fact is established, that all these dangers are less frequent after the modern improved method of removing a diseased testis, than they were after the old plan of operating; while many cases

* Richter's *Anfangsgr.* b. vi. p. 163.

† The following train of disasters from tying the whole cord are recorded; excessive pain (B. Bell); tetanus and death (Morand); convulsions, and a burning sensation in the loins (Bilguer); abscesses in the cellular texture of the cord extending far up (Richter); epilepsy afflicting the patient during the rest of his life (Theden); tension and pain of the belly, syncope, retention of urine, peritonitis, delirium (J. L. Petit.)

‡ Morand; Mursinna; Loder, *Chir. Journ.* b. i.

on record also prove, that the above-mentioned bad symptoms have often been suddenly appeased by simply cutting and taking away the ligature *; we have the most unequivocal evidence, that such application of the ligature to the whole cord has frequently been the immediate cause of all the patient's danger and suffering.

I have not ventured to load the present chapter with an account of every artifice suggested for stopping the bleeding from the spermatic arteries, without applying a tight ligature on the whole cord. My own observations in practice have now convinced me, in opposition to the sentiments expressed by Acrel † and Loder, that the vessels of the cord may be easily taken up with the forceps, or tenaculum, and separately tied; and this opinion is also confirmed by the statements of what others have seen and done. ‡ Le Dran's project of bruising the vessels of the cord between the finger and the thumb; Petit's mode of compressing the end of the cord against the os pubis §; the scheme of Le Blanc, B. Bell, Lassus and Loder, to apply to this part a broad ligature, and only just tight enough to suppress the bleeding from the spermatic arteries; and the proposal to let a compress intervene between the cord and the ligature ||; have not therefore appeared to me subjects, with which, in an elementary book, I ought to fatigue the reader's patience.

After the operation, the upper part of the spermatic cord occasionally swells so considerably, that it becomes strangulated by the abdominal ring, and vast suffering is the consequence. Authors state, that this sort of case may require a division of the aperture producing this constriction. ¶ In order to prevent such strangulation, Garengot, Arnaud, and Plattner,

* See cases in the *Chirurgical Works of B. Gooch*, vol. ii. p. 240. 8vo. Lond. 1792; *Petit, Traité des Maladies Chir.* t. ii. p. 528, &c.

† *Acrel, Chirurg. Vorfälle*, b. i. s. 447; *Loder, Chirurgisch-Medicinische Beobachtungen*, p. 111. 8vo. Weimar, 1794.

‡ See *Œuvres Chir. de Desault*, t. ii. p. 451—455. *C. Bell's Operative Surgery*, vol. i. p. 229. "M. Roux (says another modern writer) took up all the arteries with a pair of dissecting forceps, and he did this exceedingly well, never once letting the instrument slip off them." See *Cross's Sketches of the Medical Schools of Paris*, p. 141.

§ "The chance of the compress's slipping, I should think (says Mr. Bromfield), makes this practice warrantable, *as I have seen the spermatic artery dilated to the size of a crow's quill, &c.* More than one have died by making the trial, &c." *Chir. Obs. and Cases*, vol. i. p. 169. Another surgeon found the spermatic artery in a case of sarcocele, as large as the radial. *Flajani, Collezione d'Osserv.* t. ii. p. 143.

|| See *Richter's Chir. Bibliothek*, 8 B. p. 274.

¶ *Bertrandi, Traité des Opérations*, p. 209.

think, that in the performance of castration, the inner pillar of the ring should always be dilated; a plan, which is likewise approved of by Le Dran and La Faye, with some limitation. On this point, however, the remarks of their countryman, Sabatier, are more judicious. It cannot, says he, be a matter of indifference to divide either of the aponeurotic bands, by which the external oblique muscle is inserted into the pubes; and he conceives, that such a proceeding must be attended with a certain risk of bringing on inflammation within the abdomen. The present manner of securing the vessels of the cord, he observes, supersedes all occasion for the practice, because tying them separately never produces so considerable a swelling of the cord, as used to be not an uncommon effect of the inclusion of the whole of this part in the ligature. *

CHAPTER XIV.

CIRSOCELE AND VARICOCELE.

THE latter term implies nothing more, than a preternatural dilatation of the blood-vessels of the scrotum. These, like the vessels in other parts of the body, are liable to become varicose; but they are seldom so much enlarged as to be troublesome, unless such enlargement is the consequence of a disease either of the testicle, or of the spermatic cord. In this circumstance, the original disease claims our attention, and not this simple effect of it; and, therefore, as Mr. Pott observes, the varicocele, considered abstractedly, is a disease of no importance. †

The cirsocele is a varicose distention and enlargement of the

* Sabatier de la Médecine Opératoire, t. ii. p. 302.

† Pott's Chirurgical Works, vol. ii. p. 383. edit. by Earle, 1808. It is proper to observe, however, that many writers understand by the term *varicocele* not only a varicose state of the superficial veins of the scrotum, but also the same disease as Pott and others imply by the word *cirsocele*, as may be seen by turning to the works of Callisen, Delpech, &c. Syst. Chir. Hodiernæ, t. ii. p. 110. 8vo. Hafniæ, 1800; Précis Élémentaire des Maladies réputées Chirurgicales, t. iii. p. 264. 8vo. Paris, 1816. By a *varicocele*, Petit means the disease called *cirsocele* by Pott, Gooch, and others (see Traité des Mal. Chir. t. ii. p. 498.); and, lastly, there are other writers, who employ the terms quite synonymously, as Lassus, (see Pathologie Chir. t. i. p. 345.)

spermatic veins, combined in some instances, (if we are to believe Richter,) with a similar affection of the lower portion of the vas deferens, the convoluted canal of the epididymis, and even of the tubuli seminiferi testis, which, he says, becoming displaced from within the tunica albuginea, leave it behind like an empty cyst, and being blended with the vessels of the epididymis, compose the unnatural mis-shapen mass perceptible in the scrotum. It is further asserted, that the swelling of the seminal ducts does not depend upon their increased diameter only, but also upon a thickening of their coats. That the blood-vessels are dilated, and contribute very much to the tumour, is beyond a doubt; and the same writer further assures us, that a thickening of the cellular texture of the spermatic cord has also some share in the disease. *

Cirsocele frequently occasions great uneasiness, and sometimes a wasting of the testicle. It is commonly limited to that part of the spermatic cord, which is below the abdominal ring; and the vessels are generally larger, the nearer they are to the testicle. It is attended with a sense of weight in the scrotum; an unequal knotty swelling; and, if the disease affects the whole corpus pampiniforme, with a feel that seems to arise from a bundle of ropes, or earthworms. The disease generally begins at the lower part of the spermatic cord, by the side of the testis. Excepting the uneasy sensation of weight in the scrotum, and a little tenderness when pressed, the recent cirsocele is productive of only trivial, or even no inconvenience. But in an advanced stage of the disease, very severe pains gradually come on, sometimes extending upward to the back and loins, and downward to the thigh. The case does not invariably make the kind of progress above described: it is often confined to the spermatic cord, or epididymis; and it has been known to continue in this state for many years, without increasing, notwithstanding the patient's employments were of a nature very likely to aggravate the disease. Standing long at a time, walking, horse-exercise, great exertions of the lungs, and every thing requiring forcible expirations, always augment the turgidity of the veins, and the painful sensations experienced by the patient. The weight of the testis, when this organ is not wasted, appears also to have a similar effect. †

The considerations which induce Richter to believe, that, in cirsocele the dilatation is not confined to the veins, but affects

* Richter, Anfangsgr. der Wundarzneykunst, b. vi. p. 165.

† Delpach, Précis Élémentaire des Mal. Chir. t. iii. p. 266.

also the excretory ducts of the testis, are the following: when the tumour is compressed, the patient experiences the peculiar kind of pain always felt when epididymis is squeezed. The swelling, at its commencement, manifestly originates in the vicinity of the epididymis. Pressure and a horizontal posture only produce an inconsiderable diminution of it; whereas, if it proceeded altogether from varicose veins, it would, no doubt, be in this manner very materially lessened. The swelling itself is often very tender, and even painful. The feel, as if the tumour were composed of a bundle of numerous hard cords, or worms, cannot be occasioned by varicose veins. Nor, says this author, can the flaccid and wasted state of the testis be thus satisfactorily explained. Sometimes the swelling is so large, that it could not be solely an effect of a dilatation of the veins. When once the disease has begun, the patient can rarely be entirely freed from it, a thing, which would hardly be the case, if the disease were nothing more than a varix of the veins.*

The inferences which Richter has made appear to me to be partly correct; correct, inasmuch as cirsocele is frequently not an affection limited to the spermatic veins. Indeed Pott, and every other modern author, describes the atrophy of the testicle, which is so often one of its effects. The dilatation of the epididymis, the thickening and enlargement of the neighbouring part of the vas deferens, and the diseased state of the cellular membrane of the spermatic cord, are also circumstances which are highly probable. But, with respect to the displacement of the tubuli seminiferi from the cavity of the tunica albuginea, the change which they are alleged by Richter to undergo, and their contributing to the tumour, nothing short of an anatomical demonstration of these events can justify their admission as facts. On the contrary, the wasting of the testis is in all probability the effect of the action of the absorbents, which more or less remove the texture of its glandular part: an effect which might be expected, as a gradual consequence of the very obstructed state of the circulation of blood in the organ. And, with respect to the tumour not diminishing considerably when compressed, or the patient keeps himself in the recumbent posture, this statement is far from coinciding with what I have observed in practice, or what is related by very experienced surgeons. My intention in these remarks, however, is only to suggest, that Richter has carried his sentiments upon the

* Richter, Anfangsgr. der Wundarzneykunst, b. vi. p. 166.

state of the parts in this disease, further than facts appear to warrant; for, I believe that, within certain boundaries, they are perfectly accurate, and entitled to credit.

This disease is more frequently, than any other disease, mistaken for an omental rupture. A friend of mine, who was in the army in Bengal, put himself to the expense of returning to England, in consequence of his having been told by the surgeons in India that he had a rupture, while his complaint was only a cirsocele, unaccompanied with any severe symptoms. When nothing is done for the relief of this complaint, it gradually enlarges, and extends upwards towards the abdominal ring. At length, the thickening and dilatation of the whole venous and cellular texture of the cord attain such a degree, that the ring itself seems dilated. In this state, the disease is particularly apt to resemble an omental hernia. As the tumour now extends into the ring, while this is also enlarged, there may be an appearance, as if the parts actually protruded from this opening; and, as Richter himself acknowledges, since, in this advanced stage of the disease, the veins always contribute very much to the swelling, this, like an omental rupture, undergoes a considerable increase, when the patient remains a good while in the standing posture, coughs, or holds his breath, and it subsides, when he lies down for any length of time. Sometimes, like a hernia, the swelling even admits of being partly pressed up into the abdomen.

A little attention, however, will enable the surgeon easily to distinguish the two diseases. In the first place, an enquiry into the history of the case from its commencement, will elucidate the question; from such enquiry, it will be learnt, that the swelling first appeared at the lower part of the scrotum, and had no connection with the abdominal ring. The peculiar sensation felt by the patient, when the tumour is pressed upon, and, in some cases, the wasted state of the testis, are other circumstances, which will leave scarcely a doubt of the disease being a cirsocele. Lastly, it may be remarked, that the increase and diminution of the swelling happen quite differently from what they do in an omental rupture. Cirsocele, under the circumstances above specified, not only enlarges or diminishes very slowly, but, whilst it is increasing, or subsiding, nothing can be felt descending or ascending through the abdominal ring by the surgeon's finger, which is kept upon that opening. When two of the fingers are firmly applied to the same aperture, the swelling enlarges from the accumulation of blood in the veins; but nothing is felt falling down, as would be the case, if the disease were a hernia. In addition to these marks of discrimination, it is

to be recollected, that various symptoms of an omental rupture are here absent.* The direction which Mr. A. Cooper gives for avoiding mistakes, is simple and good; the patient is to be placed in a horizontal posture, and the swelling emptied by pressure; the surgeon is then to put his fingers firmly upon the abdominal ring: if the case be a hernia, the tumour cannot re-appear, as long as the pressure is continued at the ring; but, if the disease be a cirsocele, the swelling will appear again with increased size, on account of the return of blood into the abdomen being prevented by such pressure.†

A cirsocele may be really combined with a hernia; a case which is extremely perplexing, because the former complaint renders the patient incapable of wearing a truss.

CAUSES OF CIRSOCELE.

The generality of surgical writers impute the origin of this disease to circumstances, which they think are calculated to produce either a relaxation of the seminal vessels, a greater determination of blood to the parts of generation, or an impediment to the easy return of the same fluid from the testis through the spermatic veins. Hence, excessive indulgence in venery; a severe bruise of the groin‡; any thing retarding the flow of blood through the lower vena cava; a sedentary life; and the pressure of an ill-made truss upon the spermatic cord, are particularly specified as conducive to the disease. It has also been asserted, that the complaint most frequently affects the left testicle; a circumstance, which is attempted to be explained by the pressure made by the sigmoid flexure of the colon upon the spermatic vessels in its distended state.§ It is not clear, that any thing very certain is known concerning the periods of life most liable to the complaint. One good author informs us, that young persons are more liable to it than adults||; while another of equal repute assures us, that it is commonly met with in adults and old subjects, and but rarely in young persons.¶ I have seen the disease in patients both young and old, though never in children: the case mistaken for omental hernia, and on that account sent home from

* Richter, Anfangsgr. b. vi. p. 168.

† See A. Cooper's *Anatomy and Surgical Treatment of Inguinal and Congenital Hernia*, fol. Lond. 1804.

‡ See Case recorded by Gooch, in his *Chir. Works*, vol. ii. p. 244.

§ Petit, *Traité des Maladies Chir.* t. ii. p. 501. 8vo. Paris, 1774.

|| Lassus, *Pathologie Chir.* t. i. p. 346. 8vo. Paris, 1809.

¶ Delpéch, *Précis Élémentaire des Maladies réputées Chirurgicales*, t. iii. p. 266. 8vo. Paris, 1816.

India, took place in an officer not more than eighteen years of age. On the whole, it may be truly said, there is such a degree of obscurity about the exact causes of cirsocele, as may properly shake our confidence in the statements usually delivered upon the subject. As Delpech remarks, we do not find the complaint more common in subjects affected with varices of their legs, than in other persons; and, it is even unusual to see these two affections occurring together. We know nothing precise concerning the kinds of constitutions, climate, and avocations, promoting the origin of cirsocele. It has not been demonstrated, that such enlargements of the abdominal viscera, as may be supposed apt to retard the circulation through the great vessels, have really given rise to the present disorder; and although it be proved, that certain laborious employments exasperate the disease, after it has actually commenced, and unequivocally influence its future progress, we are not justified in ascribing its origin to causes of this description, for they are frequently absent and beyond suspicion. It appears also, that without the concurrence of other more efficient causes, the foregoing may even have no effect at all, since cirsoceles have been known to affect at first the spermatic cord and epididymis, and then remain stationary for a long series of years, notwithstanding the constant habit of horse-exercise, the use of wind instruments, the fatigue of campaigning, &c.*

TREATMENT OF CIRSOCELE.

Even when the disease is but little advanced, an entire cure can seldom be effected. When the disorder occasions pain, cold, saturnine, and alum lotions should be applied over the testicle and cord; blood should be repeatedly taken away by means of leeches; the bowels should be kept gently open; the patient should be placed in a horizontal posture; and the testicle should be supported with a bag-truss.

In ordinary cases, supporting the testicle with this kind of suspensory bandage, is the only thing to which the patient finds it necessary to attend.

One can hardly suppose a case so severe, and incapable of palliation, as to require the performance of castration, though such instances are mentioned by very good authors. Thus, we have upon record an example, in which a cirsocele appears to have followed a violent blow upon the groin. The imme-

* Delpech, *Précis Élémentaire des Maladies réputées Chirurgicales*, t. iii. p. 266, 267. 8vo. Paris, 1816.

diate consequences of the injury were appeased by antiphlogistic remedies; but, after two or three months, the pain in the spermatic cord, which had never been entirely suppressed, became considerably more violent, affecting also the loins and testicle; the testicle itself being diminished, and the epididymis enlarged. Notwithstanding every means, external and internal, the sufferings increased, and became so insupportable, that the patient could get no rest, night or day, without the constant use of opiates. Hence, castration was done, and a speedy cure ensued.*

CHAPTER XV.

HERNIA HUMORALIS, OR INFLAMED TESTICLE.

SYMPTOMS.

ACCORDING to the excellent description which Mr. Hunter has left us of this complaint, the first symptom is generally a soft, pulpy, fulness of the body of the testicle, which is exceedingly tender when handled. This fulness increases to a hard swelling, accompanied with considerable pain. The hardest part is commonly the epididymis, and principally the lower portion of it, as may be distinctly felt. The spermatic cord is often affected, and particularly the vas deferens, which is thickened, and, when touched, very tender and painful. The spermatic veins sometimes become varicose; cholicky pains may be experienced in the bowels; and sickness is a common symptom, and even vomiting. In some cases, a great accumulation of air takes place within the alimentary canal, producing much oppression and inconvenience.† The bowels in other instances are obstinately constipated, and if this symptom be conjoined with incessant vomiting, a large tumour of the scrotum, and great swelling and thickening of the spermatic cord, the case may partly resemble a hernia, from which, however, a surgeon well acquainted with all the characters of the latter disease, will have no difficulty in distinguishing it. A severe pain in the

* See the *Chirurgical Works of B. Gooch*, vol. ii. p. 244. 8vo. Lond. 1792.

† See a *Treatise on the Venereal Disease*, by John Hunter, p. 54. 2d edition, 4to. Lond. 1788.

loins is usually attendant on the complaint. In addition to the preceding complaints, the patient in severe cases has a great deal of symptomatic fever, pain shooting down the thighs, and considerable heat and difficulty in making water. The description of the manner in which this disease commences, as delivered by some other writers, does not however correspond altogether to the foregoing account. Thus, Richter asserts, that the patient first complains of pain in the groin; then the spermatic cord becomes swollen, particularly the vas deferens; and shortly afterwards the epididymis; but, says he, the testis itself always swells the last, and frequently not till some days have elapsed.* The scrotum, in consequence of the distention which it suffers, becomes smooth, loses its corrugated appearance, and is redder than in the healthy state. The disease rarely affects both testes at once; though, as Mr. Hunter observes, it sometimes happens, that the swelling changes from one of these organs to the other with surprising rapidity.† In slight cases, the vas deferens and epididymis may be affected alone ‡; but in all usual examples, the body of the testis is equally implicated. Any man, says Mr. Hunter, who is accustomed to know the difference between a swelling of the whole testis, and that of the epididymis only, will immediately be sensible, that in hernia humoralis, the whole testis is commonly swelled. This organ assumes the same shape that it does from other causes, where we know from being obliged to remove it, that the whole has swelled, and the pain is in every part of it. Mr. Hunter has seen hernia humoralis suppurate at the anterior part of the swelling; he has known several instances, in which the complaint produced adhesions between the tunica albuginea and tunica vaginalis, as was discovered after death, or in the operation for a partial hydrocele. Such changes, says he, could not have taken place, if the body itself of the testis had not been inflamed.§

CAUSES.

Inflammation of the testicle may arise from any of those causes which commonly excite this affection in other parts. A bruise may occasion a hernia humoralis; we see it purposely caused by the surgeon, when he undertakes the radical cure of a hydrocele. But, of all the various causes of this complaint, by far the most frequent is irritation in the urethra. Hence,

* Richter, Anfangsgr. b. vi. p. 171.
 ‡ Richter, loco supra citato.

† On the Venereal Disease, p. 54.
 § Hunter, Ibid. p. 55.

It more frequently arises in consequence of a gonorrhœa, than any other cause; and persons with bad strictures, for which they are using bougies, are also particularly exposed to its attack. It is commonly thought, that, in cases of gonorrhœa, a swelled testicle occurs with particular frequency, when the patient takes too much exercise, employs stimulating injections, drastic purgatives, or indulges in coition and spirituous drinks. It is also believed, that the complaint is less likely to happen, when the scrotum is well supported with a bag-truss, during the continuance of the discharge from the urethra. It is very remarkable, that, in cases of gonorrhœa, the pain in making water, and the quantity of purulent discharge from the urethra, are almost always very suddenly diminished, as soon as the testicle begins to enlarge; the discharge, indeed, being frequently quite stopped. This curious circumstance has attracted a great deal of attention, and has been repeatedly adduced, by theorists, as a proof of the *metastasis* of a * disease, or of a sympathy between the testicle and urethra. The latter sentiment was espoused by Mr. Hunter and Girtanner, and is what is at present entertained by the generality of modern surgeons: the arguments in its support are indeed both numerous and weighty. Inflammation of the testicle is sometimes manifestly excited by simple local irritation in the urethra, as by the introduction of a bougie. Certain inflammatory swellings of the inguinal glands are commonly acknowledged to be nothing more, than sympathetic effects of local irritation in that canal. Most of the authors who believed in the doctrine of hernia humoralis being a consequence of the translation of the matter of gonorrhœa from the urethra to the testicle, believed also that such matter was impregnated with the syphilitic virus. Yet, their credulity ought to have been shaken, when daily experience revealed to them, that the inflammation and swelling of the testicle ultimately subsided, without ever being followed by any other secondary symptom, which would often have ensued, even according to what we now know of syphilis, had the complaint truly arose from the venereal poison really attacking the part. These ready believers ought at least to have hesitated in making the inference which they did, when it was well known to them, that a hernia humoralis never originated from a syphilitic chancre, although, in this particular case, other parts, at a greater or lesser distance from the sore, did really have the

* A hernia humoralis from clap, is often named by the French surgeons, "*la chaude-pisse tombée dans les bourses.*"

effects of the virus thrown upon them by the action of the absorbents. The discharge from the urethra, as I have remarked, generally stops or undergoes a sudden and considerable diminution, and does not return till the testicle gets better. This fact is variously accounted for by different authors. Hunter would explain it by the sympathy between the urethra and testicle; while others argue, that the running ceases, not exactly on such a principle, nor from any metastasis of the clap to the testicle, but because by some of the causes above alluded to, the inflammation of the urethra is rendered more violent, in which state, the process of secretion from it is checked, or suppressed; an opinion, however, liable to objection, as will be presently noticed. It is urged, that whatever makes the inflammation in the urethra worse, may cause a hernia humoralis requiring only simple antiphlogistic treatment.

Perhaps, at the present day, the curability of the disease without mercury would not be allowed to have much weight in deciding whether the case were syphilitic, or not; but, it is surprising, that it had not more influence in less enlightened periods, when it was not uncommonly supposed, that no form of the true, venereal disease could be eradicated, without the aid of its great reputed specific, mercury. That the swelling of the testis could not arise from syphilis *, might have been inferred from the consideration, that the tumour often came on quite suddenly, and as suddenly disappeared, or shifted, to the other testicle; and that it often subsided with wonderful rapidity, on the removal of the irritation in the urethra, or the exhibition of an emetic. It might also have been seen, that, in certain instances, the clap did not stop, until the testis had been affected some days; nor would anatomy have warranted any supposition of the existence of a set of absorbent vessels, whose course qualified them for conveying the matter of gonorrhœa directly from the urethra to the testicle. †

Although, from what has been observed, it would appear, that a hernia humoralis, in cases of gonorrhœa, is frequently a sympathetic effect of irritation in the urethra upon the testis, there is some reason for suspecting, that this is not invariably the case. Thus, as Mr. Hunter remarks, as singular a circumstance as any, respecting the swelling of the testicle, is, that it does not always come on, when the inflammation in

* Mr. Hunter assures us, that, as far as his experience goes, the testis is never affected with the venereal disease, either local, or constitutional. See *Treatise on Venereal Disease*, p. 56.

† Richter, *Anfangsgr. b. vi. p. 172.*

the urethra is at its height. He thought, indeed, that it oftener happened, when the irritation in the urethra was going off; and, sometimes, even after it had entirely ceased, and when the patient conceived himself to be quite well. * Sometimes the swelling of the testis occurs, without any stoppage of the running. In certain examples, the patient has no painful sensations in the urethra; and the affection of the testis has been known to commence as late as a fortnight after the gonorrhœa and all its usual symptoms had entirely ceased. †

Another mode of accounting for this not unfrequent inflammation of the testis in cases of gonorrhœa, is, by supposing the irritation to be propagated from the mouth of the vas deferens successively to the spermatic cord, epididymis, and the body of that gland. But, the truth of this conjecture is doubted by Hunter, on the ground, that a hernia humoralis is as frequent in cases where the inflammation extends only a little way along the urethra, as in other cases, where it reaches further, and the mouths of the vasa deferentia must be more or less inflamed. He thought also, that, if this explanation were correct, both testes ought to be more commonly affected together.

Leaving these abstruse points to the consideration of such readers as may feel inclined to theorize further upon the subject, I shall rest contented with merely knowing and mentioning the fact, that, in cases of gonorrhœa, the occurrence of hernia humoralis is usually attended with a sudden, and considerable, diminution, and even a total cessation, of the strangury, and discharge from the urethra. This amendment, in the latter complaint, generally continues till the vehemence of the hernia humoralis has abated, and then the pain in making water, and the copious discharge, frequently recur.

Inflammation of the testicle, however, is a complaint remarkable for its irregularities. In a few cases, the swelling of the testicle, instead of being followed by any diminution of the discharge from the urethra, as is most common, is immediately succeeded by a return of the running with increased violence, which remains as long as the hernia humoralis itself. ‡

TREATMENT OF HERNIA HUMORALIS.

The patient should be kept perfectly quiet, and in a horizontal posture in bed. If he be young and robust, the swell-

* Treatise on the Ven. Disease, p. 56. edit. 2.

† Swediaur.

‡ J. Hunter, op. cit. p. 55.

ing of the part considerable, and the pain in the loins very violent, phlebotomy may be practised; the quantity of blood taken away, and the repetition of the operation being determined, by the patient's ability to bear the evacuation, and by the state of the local disease. In very severe cases, where yet the stomach was quiet, I have frequently prescribed nauseating doses of tartarized antimony, with decided advantage. In almost every case, bleeding with leeches is to be repeatedly put in practice, and saline purgative medicines administered. With regard to local applications, as far as my own observations extend, fomentations and poultices prove more beneficial than cold astringent lotions. But, an object, of the highest importance, is to keep the testicle constantly supported, by means of a bag-truss, or suspensory bandage. This often relieves the violent pains in the back and thigh immediately it is put on, and its employment therefore should never be neglected.

Mr. Hunter states, that emetics have been known to remove the swelling almost instantaneously. Without giving full credit to the literal meaning of this observation, it is very certain, that the great degree of swelling, in cases of hernia humoralis, often occurs and subsides more rapidly, than in any other inflammatory affection whatever.

When the pain in the part and loins is unusually severe, opiates become necessary.

After the inflammation is completely subdued, the hardness of the epididymis commonly remains. Sometimes, this may be lessened by frictions with camphorated mercurial ointment, or the use of discutient plasters; but, in general, more or less of such induration continues during life. Mr. Hunter suspected, that, in some testicles, which remain indurated at the epididymis, the latter canal is impervious, and the organ of course totally useless. This kind of hardness is in other respects not at all disposed to give trouble, or degenerate into a malignant disease, or extensive sarcocele, affecting the whole of the testis. At least, experience proves, that such consequences are very rare.

Inflammation of the testicle sometimes, but not often, terminates in suppuration of the part affected; and the matter may be situated either in the cellular membrane of the scrotum, within the tunica vaginalis, or in the substance of the testis. When the abscess is quite evident, there should be no delay in opening it. Small suppurations of the testis are alleged not to unfit the part for its function in the animal economy.* When

* Richter, Anfangsgr. b. vi. p. 178.

the pulpy substance of this organ is affected, the tubuli testis of which it is composed are said to be liable to be discharged with the matter, in the form of grey stringy particles; and the more of it the surgeon draws away, the smaller the testis becomes, so that at length, if this plan be followed up, the tunica albuginea is left by itself quite empty, with the remaining epididymis. *

CHAPTER XVI.

OF CANCER SCROTI; CHIMNEY-SWEEPERS' CANCER; OR SOOT-WART.

THE chimney-sweepers' cancer was first described by the celebrated Mr. Pott. It is said to be endemial in this country; a circumstance, that is ascribed to the particular kind of soot which arises from the vast quantities of sea-coal here consumed as fuel. At all events, the disease has never been noticed in France †; and Ramazini, who published in Italy respecting the disorders to which workmen are particularly exposed, makes no mention of the cancer scroti. ‡

This disease almost always makes its first appearance in the inferior part of the scrotum, where, as Mr. Pott observes, it produces a superficial, painful, ragged, ill-looking sore, with hard and rising edges. With the exception of one case, which was shown to him by Sir J. Earle, and which occurred in a child under eight years of age §, that eminent surgeon never saw the complaint occur under the age of puberty. In no great length of time, it makes its way completely through the scrotum, and attacks the testicle, which it enlarges, hardens, and renders thoroughly distempered. Next, it extends up the spermatic cord, contaminating the inguinal glands, and parts within the abdominal ring, and then very soon becoming painfully destructive.

* See Petit, *Traité des Maladies Chir.* t. ii. p. 513, &c. 8vo. Paris, 1774. Also, *Mém. de l'Acad. de Chir.* t. iv.; and Morand, *Opuscules de Chir.* 4to. Paris, 1768.

† Richerand, *Nosographie Chirurgicale*, tom. iv. p. 290. edit. 2.

‡ De Morbis Artificum.

§ See Pott's *Chirurg. Works*, by Earle, vol. iii. note, p. 178. edit. 1808.

It is supposed, that this terrible malady commonly derives its origin from the lodgment of soot in the rugæ of the scrotum. Hence, at first, it must be entirely of a local nature.

It is proper to observe, that though this peculiar disease hardly ever occurs, except on the scrotum, two rare examples have been recorded by Sir J. Earle, in which the distemper happened in other situations. In one instance, it attacked the face; in another, it took place on the back of the hand.*

Mr. Pott believed the malady was confined to chimney-sweepers; but Sir J. Earle has seen it in other descriptions of persons, in whom, however, the origin of the complaint was traced to the action of soot.

TREATMENT.

Mr. Pott remarks, that if there be any chance of putting a stop to the above mischief, it must be the immediate removal of that part of the scrotum where the sore is; for, if it be suffered to remain until the testicle becomes affected, the performance even of castration will generally be too late. Mr. Pott states, that he has many times made the experiment, and that though the wound made by such operation sometimes healed favourably, yet, in the space of a few months, the patients generally returned either with the same disease in the other testicle, or in the glands of the groin, or with such a diseased state of the viscera, as soon ended in a painful death.

I have seen several cases of this disease in St. Bartholomew's hospital, but never knew one instance which was materially benefited by any medicines, or topical applications: I am, therefore, strongly impressed with the propriety of an early removal of the affected part of the scrotum. The loss of a portion of this part can never be attended with future inconvenience; and, as Mr. Pott most justly observes, it is a very good and easy composition for the preservation of life.

The operation, when done under the most favourable circumstances, will not always succeed: a patient, whose testicle was still unaffected, and his general health apparently unimpaired, died a month after the removal of the diseased part, with violent pains and great tension of the abdomen.†

When the disease has made too much progress to admit of extirpation, only palliative treatment can be pursued, and

* Lib. cit. p. 178—182.

† Richter's Chir. Bibl. 5 B. p. 130. This case was one which Dr. Michaelis had an opportunity of seeing when he was in England.

such medicines and applications, as are recommended in the chapter on cancer, may be employed.

CHAPTER XVII.

GONORRHŒA, OR CLAP.

WHEN an irritating matter of any kind is applied to a secreting surface, the natural secretion becomes increased in quantity, and altered in quality; and when the ordinary mucous secretion of the urethra in men, or of the meatus urinarius, nymphæ, &c. in women, is, in this manner, changed into a fluid, resembling pus, the disease is named a *gonorrhœa*, or *clap*.

The complaint has been supposed to arise from the application of venereal matter to the urethra. A preternatural discharge from this passage, however, may result from any kind of irritation affecting it; and no doubt can be entertained concerning the frequent origin of claps from the mere contact of various kinds of acrid and infectious discharges with the urethra, labia, nymphæ, &c. in coition. Altered secretions of these kinds may be formed from the mucous surfaces of the parts of generation in either sex, totally unconnected with the poison of syphilis. Strictures, and the employment of bougies, are both very frequent causes of what may be termed a gonorrhœa. Indeed, that various discharges from the urethra, attended with pain, and a sense of scalding in making water, were common, prior to the period not unfrequently assigned for the introduction of the venereal disease into Europe, is a fact, of which irrefragable confirmations exist.* Whether a species of gonorrhœa exists, which is truly syphilitic, is yet a contested point.

When the complaint follows some kind of contamination, received in coition, it usually begins about six, eight, ten, or twelve days afterwards; but it is capable of affecting some persons much sooner, and others much later.

The first symptom is usually an itching at the orifice of the urethra, sometimes extending over the whole glans penis. A

* See particularly the three Dissertations of Mr. Wm. Becket, in the 30th and 31st volumes of the Philosophical Transactions.

little fulness of the lips of the urethra is next observable. Very soon after the discharge has appeared, the itching changes into pain, especially at the time of voiding the urine. The penis, and particularly the glans, are affected with swelling. The latter part has a transparent appearance around the mouth of the urethra, the skin seeming distended, smooth, and red, like a ripe cherry. Sometimes the glans, as well as the beginning of the urethra, is more or less excoriated. This canal becomes narrower, as is proved by the stream of urine being smaller than common; a circumstance which the believers in the muscular power of the urethra would ascribe to two causes, viz. the swollen state of the lining of the canal, and its spasmodic contraction; while others, who deny the existence of any muscular power in the membrane of the urethra, would account for the diminished diameter of the canal altogether by the effects of the swelling and thickening of its lining, the distention of the corpus spongiosum, and perhaps the action of the muscles about the perineum. Small swellings are often observable along the lower surface of the penis, in the course of the urethra: these were suspected by Mr. Hunter to be the enlarged glands. In some instances, also, Cowper's glands in the perineum inflame and suppurate.

The natural discharge from the urethra is first changed from a transparent viscid secretion, to a watery, whitish, pellucid fluid; and this, becoming gradually thicker, assumes the appearance of pus. The matter often changes its colour and consistence; sometimes it is almost white; sometimes, quite yellow; and, in other instances, greenish.

Mr. Hunter was of opinion, that, in ordinary cases, the affection of the urethra did not extend very far along this canal from its orifice; perhaps not farther than an inch and a half, or two inches: this is, what he named, the *specific extent* of the inflammation.

Besides the symptoms already mentioned, a very acute, scalding pain is experienced in making water, which frequently can only be discharged by drops, or in an extremely small broken stream. The patient is also incessantly troubled with a feel as if he wanted to make water, and is obliged to be repeatedly emptying the bladder of what little collects in it.

In the neighbouring parts, a variety of other affections are occasionally produced: pain, soreness, and uneasiness, may be experienced all over the pelvis; and the scrotum, testicles, perineum, anus, and hips, may become disagreeably sensible. The testicles often require to be suspended in a bag-truss, and are so irritable, that the least exertion makes them swell. The inguinal glands may inflame and enlarge also, producing

the kind of swelling termed a *sympathetic bubo*. In many instances the bladder is unusually irritable, and cannot bear the least distention, so that the patient is, almost every five minutes, obliged to make water with violent pain, not only in the bladder itself, but likewise in the glans penis; and such pain frequently continues after the urine is discharged.

OF THE POWER OF THE MATTER OF GONORRHOEA TO COMMUNICATE THE VENEREAL DISEASE.

That many ordinary discharges from the urethra in men, and from the surfaces of the labia, nymphæ, meatus urinarius, &c. in women, have no connection whatsoever with syphilis, is a truth, which I take to be at present generally admitted. But, whether there may not be a particular species of gonorrhœa which arises as an effect of the application of syphilitic matter to the secreting surfaces above specified, and which is even capable of producing secondary syphilitic effects, in consequence of absorption, is a question that is by no means universally and finally settled. The arguments, which have been broached in support of this doctrine, are; first, the probability that the Otaheiteans had the venereal disease propagated to them by European sailors, who were affected with gonorrhœa; for, these could hardly be supposed to have a chancre during a voyage of five months, without the penis being destroyed. Secondly, Mr. Hunter mentions a gentleman, who had a gonorrhœa thrice, of which he was cured without mercury. About two months after each infection, he had symptoms of lues venerea. The first were ulcers in the throat; the second were blotches on the skin: both which forms of the disease yielded to mercury. Thirdly, two punctures were made on the penis, with a lancet dipped in the matter of a gonorrhœa. One of these produced, on the part of the prepuce, where it was made, a red, thickened speck, which increased and discharged purulent matter. This supposed chancre healed on having its surface repeatedly destroyed with caustic. The other puncture was made on the glans, where it was followed by a pimple, full of yellowish matter. This pimple was touched with caustic, and healed in the same way as the sore on the prepuce. Four months afterwards, the chancre on the prepuce broke out again; then it healed, but once more returned. This course it followed several times; but always healed without any application to it.* While the sore remained on the

* These ulcerations, inferred by Mr. Hunter to have been venereal, and yet described by him as having healed without any thing being done to

prepuce and glans, a bubo formed in the groin. A sufficient quantity of mercury was given to cure the gland locally; but not to prevent the constitution from being affected. Two months after the cure of the bubo, a venereal ulcer, according to Mr. Hunter, formed on one of the tonsils. This was cured by mercury; but the medicine was purposely left off as soon as the sore was skinned over, in order to see what parts would next be affected.

About three months afterwards, copper-coloured blotches made their appearance in the skin, and the ulcer on the tonsil recurred. This disease was again only palliated by mercury; but the complaints returned in their former situation; and were ultimately cured by a proper quantity of mercury.

On the other hand, doubts must exist concerning this account of the effects of the matter of gonorrhœa, when the following circumstances are taken into consideration:—

1st. It is impossible to say, what time may elapse between the application of venereal poison to the penis, and the commencement of ulceration. Therefore, Bougainville's sailors, alluded to by Mr. Hunter, might have contracted the infection at Rio de la Plata; but, actual ulcers on the penis might not have formed till about five months afterwards, when the ship arrived at Otaheite. At the same time it must be sufficiently obvious, that every pretended elucidation of the mode, in which the venereal disease was communicated to the natives of Otaheite by European visitors, has its importance seriously lessened by the reflection, that the assumed fact of this disease having been first imparted to the Otaheiteans by European sailors, is quite as doubtful and unproved, as the common doctrine concerning the first origin of syphilis in Europe at the famous siege of Naples, or the opinion, that the distemper was brought from the new to the old continent by the followers of Columbus. Who can presume to infer, that the island of Otaheite had never been visited by diseases of the parts of generation, before the memorable arrival of the French navigators under Bougainville? In order to justify such a belief, the clearest evidence would be absolutely requisite, and this from men whose visit to Otaheite was early enough for the purpose, and whose professional acquirements made their testimony of value. On a point of this nature, nothing like traditional accounts should be allowed to have undue weight. If

them, prove very unequivocally, that this great man knew perfectly well, that true chancres might be healed, not only without mercury, but without the use of any particular local applications.

the Otaheiteans were never subject to ulcers on the parts of generation, discharges, eruptions, &c. before their intercourse with Europeans, they could have had nothing of human nature, or of the human constitution about them; for it is universally admitted with respect to all other nations, about whose former state we know any thing, that they were unquestionably subject to diseases of the parts of generation; and the firmest believers in the fabulous descriptions of the first origin of syphilis in Europe, would never deny that such distempers prevailed long before syphilis is imagined by them to have had its existence. Now, if we are warranted in concluding from analogy, that the Otaheiteans had some diseases of the parts of generation, before they had any intercourse with Europeans, it is an undertaking far beyond my compass to investigate what the exact nature of those complaints might be. As for the fanciful origin of the venereal disease in the new world, and its importation into the old, which account, if it were true, might perhaps be construed into strong evidence against Bougainville's crew, inasmuch as there would then be some definite ground for supposing, that it must have got into Otaheite by importation, just as it did into Europe, it is a doctrine liable to many weighty objections. Supposing we were to begin with admitting, either that syphilis was first brought into Europe from America, or that it originally broke out in the French army at the siege of Naples, in 1494, and that it afterwards gradually spread from the parts of Europe primarily infected to the many other countries which have since suffered from it, I do not see that we advance a single step in the investigation of the causes of the first origin of the venereal disease. Whether the distemper were of American or Neapolitan birth, whence was derived the earliest stock of syphilitic poison? Are we to suppose, that the virus never had but a single source, and that the disease first *spontaneously* broke out only in one unfortunate male or female individual, by whose stock of infection, all the various nations of the world, and all future generations, were to be contaminated? Can the present received doctrines of syphilis be reconciled to this theory of its beginning spontaneously, without any exposure to the specific virus? The venereal disease, unlike many contagions, is not communicable through invisible effluvia in the atmosphere; and cannot extend itself, except by the positive application of the matter of the disease to some part of the body, where the poison first produces specific local effects, frequently followed by other consequences in situations at a greater or lesser distance from the point first affected, which consequences are the result of the absorption of the virus into the constitution. The

venereal disease then could never be imparted from contagion in the atmosphere; and, however contrary it may be to modern theories to imagine that syphilis could arise as it were spontaneously, without the previous contact of the virus, reason must infallibly come to such a belief with respect to the earliest supposed instance of the disease. This fact is itself extremely curious, and involves many interesting reflections, which would here carry me beyond my limits. I shall therefore merely add, that, if the disease did originally begin spontaneously, and an ulcer form of itself, capable of secreting syphilitic matter, the same thing may have happened in innumerable other examples, and the complaint, instead of having begun only in America, or in Italy, may have had myriads of self-created sources, and existed in every populous country from time immemorial. On the same principle, an attempt might also be made to account for the varieties of the complaint, and the production of different kinds of infectious matter. Such are the considerations which forbid me from attaching any importance to the opinion, that gonorrhœa is capable of communicating syphilis, and that it was actually the form of disease, in which the Otaheiteans had syphilis first communicated to them by European navigators.

2dly. The second argument adduced by Mr. Hunter is certainly inconclusive. Every ulcer in the throat is not regularly venereal. A common ulcer may heal while the patient is using mercury. Hence, the cure, apparently accomplished by this medicine, is no proof that the complaint was syphilitic. 3dly. The last fact of inoculation appears strong, and more imposing. But, though the insertion of gonorrhœal matter, or any other morbid matter, beneath the cuticle, will undoubtedly produce troublesome local complaints, may we not doubt, that the sores, in the above case, were actually venereal? Can we implicitly depend upon the continence of the subject of the above remarkable experiments, during the long space of four months, between the healing of the sore on the prepuce, and its recurrence? If we cannot, the inference, in regard to the power of gonorrhœal matter to communicate the venereal disease, remains unestablished. The experiments might have been less objectionable, in respect to the possibility of a new chancre from a different source, if the inoculation had been practised on another part, instead of the penis. But, really, at the present day, the very circumstance of a sore repeatedly healing up and breaking out again, without the exhibition of mercury, or the use of any particular local applications, would be received by the most intelligent surgeons as a decided proof of the case not being actually syphilitic. With

regard also to the secondary symptoms, the sore-throat and eruptions, it would require a more minute account of their appearance, especially of the blotches, to be able to pronounce whether they had the characters generally now supposed to appertain to the cutaneous effects of syphilis. We know not whether the eruption, for instance, was scaly or not; and, as for the sore-throat, even the deep excavated ulcer of the tonsils, is not now universally admitted as a criterion of syphilis. The fact of the sore in the throat having broken out again, after the patient had taken mercury enough to heal it, and keep it healed for three months, appears to me an argument against its being venereal on the Hunterian principles themselves. Let it be remembered also, that Mr. Hunter's experiments with gonorrhœal matter, have been repeated by others, and, if we are to credit the statements delivered by Mr. B. Bell on the subject, the endeavour to excite syphilis in this manner completely failed. Yet, possibly, the matter discharged from the patient's urethra in Mr. Hunter's cases, might be of a specific nature, and different in its quality from what was employed by other experimenters. In short, the different result of all these experiments naturally leads back to the question, whether there may not be, as Hunter and many others suppose, a gonorrhœa of a specific syphilitic nature, distinct from common simple discharges from the urethra. However, if the matter of gonorrhœa be capable of communicating the venereal disease, why does not the discharge commonly produce chancres on the glans and prepuce, with which parts it must lie in contact a very considerable time in every case? Why also does not the presence of a chancre frequently cause a gonorrhœa? If the infection of one species of gonorrhœa and syphilis, be really of the same identical nature, certainly it is extraordinary, and contrary to what would be expected in the nature of things, that the former complaint should receive no benefit from mercury, while the various forms of the latter disease are acknowledged by all parties, whether they regard this mineral as the grand specific and only remedy for the distemper, or not, to be generally cured by it in less time, and with a smaller chance of relapse, than by any other known means. I shall say nothing in the present place, concerning the sentiment promulgated by Mr. Carmichael, that claps may produce a certain train of secondary symptoms, which he distinguishes by the term of the *popular venereal disease*; it being quite enough here to mark, that, whether this gentleman's views be altogether correct or not, he is to be classed with those writers, who do not consider the poisons of syphilis and gonorrhœa as being

of the same identical nature, or capable of giving rise to similar secondary effects. *

TREATMENT.

The gonorrhoea is one of those peculiar diseases which seem to have no specific remedy; but which, at the same time, have a propensity to get spontaneously well, and gradually wear themselves out. The complaint, however, in all its forms, is at first evidently of an inflammatory nature; and though we cannot at once effect a cure, we may palliate the symptoms, and shorten their duration, by adopting certain antiphlogistic means in the first stage of the affection.

Linen, wet with the saturnine lotion, should be kept constantly applied to the penis. The patient should keep his bowels well open with saline purges; live more abstemiously than common, avoiding spirituous drinks, and all spicy food; and render the quality of his urine as little irritating as possible, by taking in the course of the day, copious draughts of some diluting beverage, such as barley-water, mucilage of gum arabic, &c.

After a few days, some attempt may be made to alter the action of the vessels of the lining of the urethra, so as gradually to make them secrete again the healthy mucous fluid, with which the canal is naturally lubricated, instead of a purulent discharge. For this purpose, astringent injections may be applied. The most common is that containing the sulphate of zinc; and, for first use, not more than five grains of this salt should be dissolved in ~~four~~ ounces of water; and the application may afterwards be strengthened by degrees. When this injection does not seem to produce much good, another one, containing the oxymuriate of mercury, sometimes answers better, one grain of which, in eight ounces of distilled water, will form a fluid sufficiently strong for first employment. Another very good astringent injection is composed of fourteen grains of plumbi superacetat dissolved in eight ounces of water.

As injections are only temporary applications, it is evident that they ought to be very frequently used. At first, however, two or three times a day will suffice. The mouth of the syringe should not be pressed against the orifice of the

* See Obs. on the Symptoms and Specific Distinctions of Venereal Disease, 8vo. Lond. 1818.

urethra, as it creates a great deal of irritation, and sometimes ulceration.

When the strangury is very severe, and there is trouble from nocturnal erections, chordee, &c. opium is to be prescribed.

Excepting opium and the balsam. copaiv., I have rarely seen any internal medicines produce manifest and unequivocal good in cases of gonorrhœa. Of late, however, the expectations of professional men have been very much raised, by the high terms in which a spice, brought from Java and China, called cubebs, has been spoken of as a specific remedy for gonorrhœa, even in its early inflammatory stage. The dose is a dessert spoonful of the powder an hour before breakfast; a second, six hours afterwards; and a third, at bed-time. The powder is to be taken in water. If given while the discharge is considerable, and the inflammation great, the painful symptoms, it is asserted, will be removed in two days, and the discharge generally terminates on the third or fourth day. The antiphlogistic regimen is to be attended to, and it is also necessary to continue the powder a day or two after the discharge has disappeared.* The few trials which I have made of cubebs, incline me to consider it as having very similar virtues to those of the balsam of copaiva. In the last case where I made trial of it, the complaint, which had existed three or four weeks, was stopped for a few days, but afterwards recurred.

CHAPTER XVIII.

GLEET, CHORDEE, SYMPATHETIC BUBOES, BLADDER AFFECTED IN GONORRHŒA.

SOMETIMES, after the cure of the specific inflammation of the urethra, upon which a gonorrhœa is supposed to depend, or after the removal of all acute inflammation, a discharge still continues, and, though unattended with pain, is often exceedingly difficult to cure. A gleet is essentially different from a gonorrhœa in not being infectious, and in

* See Adams's Short Account of Cubebs, as a remedy for Gonorrhœa, in *Edinb. Med. and Surgical Journal*, January 1819, p. 61.

consisting of a discharge, which is composed of globules, blended with the mucous secretion of the part. On the other hand, in cases of gonorrhœa, the discharge has the power of infection, and is composed of globules, mixed with a serous fluid.

TREATMENT.

Stimulating injections may be tried. Two grains of the oxymuriate of mercury, dissolved in eight ounces of distilled water, form a very suitable application. Injections frequently produce only a temporary cessation of a gleet, and the complaint soon afterwards recurs: patients therefore should not relinquish their use too soon, on the supposition of their being permanently well. It is generally advantageous to continue the use of the injection for two or three weeks, after the complete stoppage of the discharge. In some instances, seawater makes a more efficacious injection than any other. It was very common formerly to introduce into the urethra bougies, medicated with turpentine or camphor, and about four or five inches long, with a view of irritating the lining of the canal, and altering the mode of action in the vessels. Of late years, however, the practice has gone a good deal into disuse, and this is a strong test of its not having been productive of more benefit than injections, which can be used with less trouble; and the probability is, that its efficacy has been in reality very inferior.

At the same time that injections are employed, the surgeon may direct the patient to take thirty drops of the balsam. copaiv. thrice a day; or the tinctura lyttæ, beginning with a dose of ten drops thrice a day. If these medicines produce no good, though taken regularly for a week or ten days, they may be discontinued, as affording no hope of their becoming useful afterwards. Cubebs is also an exceedingly fit medicine for trial.*

Many gleets will not yield to the above plan of treatment. Patients, so circumstanced, may try cold bathing (if possible, in the sea), and rough horse-exercise. If debilitated, they should take bark and steel; and in inveterate cases, electricity, and even blistering the skin underneath the urethra, are recommended. Besides those gleets, which may be consi-

* *R. Pulveris cubebæ drachmas duas aquæ puræ uncias quatuor. M. fiat haustus ter in die sumendus.*

dered as the remains, or consequence of a gonorrhœa, there are others, which are of a very different nature, arise from other causes, and cannot possibly be benefited by the kind of treatment which is applicable to such gleets as depend solely upon a wrong action of the secreting vessels of the urethra. The cases which I here refer to, are those which arise from strictures in the urethra, or from disease of the prostate gland. Here the gleet is merely an effect or symptom of the other more serious complaint, upon the removal of which, the cure of the discharge altogether depends. Hence, when the patient consults a surgeon for a gleet of long continuance, it is often prudent, in the first instance, to examine the state of the urethra.

CHORDEE.

In cases of gonorrhœa, when the inflammation is not confined merely to the surface of the urethra and its glands; but affects the reticular membrane, it produces in the latter part an extravasation of coagulating lymph, which unites the cells together, destroys the power of distention of the corpus spongiosum urethræ, and makes it unequal, in this respect, to the corpora cavernosa penis. Hence, at the time of an erection, a curvature takes place, termed a *chordee*. The concavity of the curvature is generally at the lower part of the penis.

TREATMENT.

When much inflammation is present, bleeding from the arm, and, more especially from the part itself, by leeches, is proper. The penis should be exposed for some time to the steam of hot water. Camphorated fomentations and poultices are also remedies of which experience makes a favourable report. At the same time, opium and camphor may be given as internal medicines.

When all inflammation has been subdued, the indication is to promote the absorption of the coagulating lymph; and, for this purpose, nothing is better than frictions on the part with camphorated mercurial ointment.

SYMPATHETIC BUBO.

Gonorrhœa is sometimes attended with a swelling of the inguinal glands, termed a *sympathetic bubo*. This complaint is supposed to originate from mere irritation, and not from the absorption of matter. We know, that the lymphatic

glands are capable of becoming inflamed in this manner; for, in various diseases, we see them frequently swell at a more remote situation from the thoracic duct than the local complaint, which is the exciting cause of their enlargement. The pain, which sympathetic swellings of the glands occasion, is much less than that arising from the true venereal bubo, and it was the opinion of Mr. Hunter, that they seldom suppurated. But, in consequence of the sentiments which he entertained concerning the identity of the virus of gonorrhœa and syphilis, he also thought, that, in cases of clap, a true venereal bubo might sometimes take place, in consequence of the absorption of matter.

TREATMENT.

Whatever may be the nature of a sympathetic bubo, certain it is, that mercury is by no means necessary or useful in the treatment. This is a fact which may be considered as fully established, and confirmed by the experience of the most intelligent practitioners. The swelling may be diminished by the repeated application of leeches, and by keeping up a continual evaporation from the part, by means of linen, wet with the liquor plumbi acetatis dilutus. In short, the case is to be treated as a simple phlegmonous inflammation. When a poultice is found to afford more ease than cold applications, it is to be used.

BLADDER AFFECTED IN GONORRHŒA.

Opiate clysters, the warm bath, phlebotomy, if the patient be young and robust, and leeches applied to the perineum, are the most eligible measures to be adopted. When the troublesome and distressing affection continues very long, and is the only complaint, an opiate plaster may be applied to the loins, or a small blister to the perineum.

Cicuta, bark, and sea-bathing, are also additional means, which deserve trial.

When the bladder is extremely irritable, in consequence of a gonorrhœa, a scruple, or drachm of the powder of uva ursi may be given three times a day.

CHAPTER XIX.

PHIMOSIS.

WHEN the opening of the prepuce is so much contracted, that the part cannot be easily drawn backwards, and the glans penis exposed, the complaint is termed *phimosis*. On the other hand, when the prepuce is pulled back behind the glans, over which it cannot be brought forwards again, the case is well known amongst surgeons by the name of *paraphimosis*.

Phimosis is either a defect with which certain individuals are born, or it is the consequence of inflammation of the prepuce. The first of these cases is commonly termed *natural* or *congenital*; the second, *preternatural*, or *accidental*; but, Sabatier prefers the epithets *simple* and *complicated*, which, on some account, are undoubtedly best. *

OF THE NATURAL OR CONGENITAL PHIMOSIS.

As Petit observes, infants are almost always born with the aperture of the prepuce so small, that the glans cannot be entirely uncovered; but, when such constriction does not exceed a certain degree, it should not be regarded as any imperfection; or, at least, it sometimes gets well of itself, as the child grows up, and approaches the age of puberty, — the period when erections begin to be strong, the penis to elongate itself, and the glans to dilate the prepuce.

Some cases occur, however, in which a proper dilatation of the prepuce is not effected by the frequent erections which naturally take place as the individual approaches the age of puberty. For instance, the change cannot happen when the opening of the prepuce is exceedingly small, and the frænum very short; because then, the more forcible the erection is, the more the glans is turned downwards, whereby, instead of presenting its extremity at the aperture of the prepuce, it presents there its broad part, which cannot produce the requisite dilatation so well as the end of the glans, which being of a conical figure, can enter the constricted part, and, as it were, imperceptibly enlarge the opening.

Even when the aperture of the prepuce is not particularly small, another circumstance may prove a serious hindrance to

* Médecine Opératoire, t. iii. p. 320. 8vo. Paris, 1810.

the removal of the constriction: this is when the prepuce happens to be too long, in which case, this part yields in proportion as the penis becomes lengthened in erection, without the glans making any pressure against the contracted extremity of it, which, of course, remains undilated. Provided the urine can be discharged with ease, however, there is no absolute necessity for the opening of the prepuce to be made larger, before a certain period of life. But, says Petit, the time will arrive, when nature destines these organs for other functions, and to the performance of which the constriction of the prepuce is a great impediment. Sometimes, however, at this very crisis, the dilatation of the prepuce is completed, or the part is torn by the whole glans being forced through it: but, should the dilatation not be perfect, or should it be forced, the projecting glans would then be incapable of returning into its place, and a paraphimosis, which is frequently a serious disease, be the result. Sometimes, when the circumference of the opening of the prepuce is lacerated by an effort of the glans to pass through it, the prepuce cannot be replaced without difficulty; and even though it be easily replaced, the circumference of the opening is liable to inflame and produce a phimosis. Petit assures us, that he has known this happen in several instances to new-married men upon their nuptial night.

Individuals, who naturally have the opening of the prepuce only half the ordinary size, and whose lives are devoted to continence, run no risk of the foregoing inconvenience; but they are liable to another annoyance: the sebaceous fluid, which the glands of the corona glandis pour out, collects under the prepuce, and growing acrid, produces itching, inflammation, and a discharge of matter, very like gonorrhœa, except that the fluid does not come out of the urethra. The likeness between the two complaints, in fact, has sometimes deceived not only the patient himself, but the inattentive surgeon, by whom the discharge has been actually pronounced to be a real clap.

When this kind of disease is unskilfully treated, the prepuce sometimes becomes adherent to the glans; a complication, which, from whatever cause it originates, is frequently troublesome and vexatious. Petit details several interesting examples of it.

A young man, who went to consult him, related, that he had been married to a young widow a fortnight, but had been quite unable to consummate the marriage. It seems he was a novice, and had never made an attempt upon any women, except his new wife; but she, having had greater experience, soon

discovered that he was not made like her first husband, and very discreetly recommended him to apply to Petit. The young man stated, that, when he attempted to have connection, he put himself to considerable pain, and hurt his wife. Petit at once saw, that the circumstance could not be accounted for by the size of the part; but the prepuce was found every where adherent to the glans, except to the extent of about one line round the orifice of the urethra. Hence, when an attempt was made to introduce the penis, two things happened; first, the opening of the urethra was forcibly dragged at every point of its circumference, and a great deal of agony was produced; secondly, the penis, instead of gliding over the parietes of the vulva, propelled them into the vagina, and thus put the lady also to considerable pain. In fact, when Petit examined her, the nymphæ had been so much lengthened by the pressure of the penis, that, in coition, they were reflected into the vagina.

In this curious case, Petit began by cropping the lady's nymphæ, and it was his intention to have done nothing to the gentleman, as it was conceived that, after what had been done for his wife, he would experience no further pain nor difficulty, provided she followed a simple, though not very surgical, piece of advice given her by Petit, which was, to lubricate her parts well with white of egg before she went to bed! But, says Petit, whether the parties were out of patience with a preliminary which restrained the gratification of their passions, or whether the husband suspected, that the pleasure would be enhanced if the glans were naked, he absolutely insisted upon having the operation done.

Here, the adhesion of the prepuce was owing to a phimosis, which the patient had had from his birth, and for which no operation had been done, though, had it been attempted in time, it would have been a mere trifle. When about seven or eight years of age he was troubled with repeated excoriations upon the glans and prepuce, ending in a concretion of the parts.

The same eminent surgeon was consulted by another strong, healthy young man, for a similar adhesion of the glans to the prepuce, but from a very different cause. The patient, when a child five or six years old, used to wet his bed, and, in order to avoid the birch, and the anger of his parents, he took it into his head to tie up his yard with a piece of pack-thread. The night on which this experiment was made, he succeeded in hindering the calamity which he so much feared; but he awoke in great pain, both from the tightness of the ligature, and from excessive desire to make water. He now

found, that he could not untie the packthread, for the double knot which had been made, as well as the circle of the string, was quite concealed by the swelled integuments, but he was afraid of complaining. His state, however, was at length betrayed by the increase of his sufferings, and fever. The family surgeon was sent for, who was obliged to cut the packthread with a bistoury, which could not be done without dividing the skin itself pretty deeply.

The child was at first unable to expel his urine: more than a quarter of an hour elapsed before he could do so, and then not before a catheter had been passed to dilate the constricted part of the canal; nor did the pain in the penis undergo any diminution until the bladder had been emptied. Applications for the prevention of mortification were now employed; but, notwithstanding their prompt use, gangrene took place in the situation of the ligature, and several sloughs afterwards separated. The prepuce and glans inflamed, and pressing against each other, the surfaces in contact suppurated.

After listening to this account, Petit examined the parts: the glans was entirely concealed by the prepuce, which was nearly an inch longer than it; a probe entered the urethra; but, in consequence of adhesions, it could not be moved round between the foreskin and the glans. An operation was advised, and performed; but the method of proceeding in cases of this description will be hereafter considered; and, for the present, I shall follow Petit, by going on with the subject of congenital phimosis.

Some children are born with the opening of the prepuce so narrow, that the urine cannot be discharged without difficulty; and there are others, whose prepuce has no aperture at all; consequently, they cannot make water. Petit informs us, that he met with the latter sort of phimosis only twice; but the other case is very frequent.

When the prepuce has no opening, the nurses and attendants are soon apprised of it by the linen continuing dry; by the infant being in pain and crying a great deal; and by the urine, which cannot be discharged, accumulating in the cavity of the prepuce, and occasioning there so considerable a swelling, that the penis and scrotum are entirely hidden by it. The tumour is round, smooth, white, and elastic, like a hydrocele, which is very full and tense. As it is somewhat narrower towards the pubes, one might suppose, that it has a pedicle; but this smaller part of it is the penis, the integuments of which have yielded, and contributed to the enlargement of the swelling, in proportion as the urine has escaped from the urethra.

"If," says Petit, "I was surprised to see this tumour for the first time, the women, who had charge of the infant, were still more so: only two hours had passed since they had washed, cleaned, and bound it up in its swaddling clothes, and far from imagining the parts ill-formed, they had been pronouncing a very favourable opinion upon them."* When the circumstance had been related to Petit, he knew the case immediately, and, dispelling the alarm of the attendants, he gave the child instantaneous relief by an operation, which will be presently noticed.

The other child, on whom Petit did a similar operation, was not quite so lucky. As soon as it had been baptized, it was conveyed into the country; there was no time for ascertaining the nature of its complaint; and the nurse, who had not seen it before the journey, was compelled directly on her arrival home to undress it, as it had cried the whole way. She was very much astonished to find so large a swelling in the situation which it occupied; she, to whom a perfectly formed male child had been supposed to have been confided. She made the family acquainted with the occurrence, and sent for the surgeon of the village, who was as ignorant as herself of what the case was. However, he directed fomentations with warm wine, which was doing nothing; and the infant's belly grew tense, hard, and painful.

An aunt of the child's took Petit along with her to visit it, who saw the nature of the complaint, and by means of an operation, like what he did in the preceding instance, a pint of urine was let out. A cure was thus accomplished in so expeditious a manner, that the bye-standers were nearly as much surprised at it, as they had been at the disease itself. Indeed, Petit reached the infant only just in time to save its life; for, when he entered the room, its respiration had nearly ceased, its body was livid, and its extremities cold, and covered with a clammy sweat. The instant after the operation, its plaintive cries stopped; it began to suck, and fell asleep.

Had the urine not been let out, the child must have perished with all the symptoms of a retention of urine: in fact, it was such a retention, since the course of the urine was intercepted, with this difference, that the impediment to the exit of this fluid was neither in the bladder, nor the urethra. The prepuce being impervious, the urine could not get out;

* "Elles en avoient fait l'éloge, et un prognostic avantageux." Petit, *Traité des Maladies Chirurgicales*, t. ii. p. 428.

the consequence was, that it had distended the bladder, the ureters, the kidneys, and the urethra itself, before producing an expansion of the prepuce. It was this part which made the longest resistance to the impulse of the fluid; but it had at length yielded, and gradually been dilated into a sac, or cyst, which was as large as a turkey's egg.

Petit assures us, that he has seen nearly the same thing happen, though the prepuce was not entirely closed, but its aperture smaller than that of the urethra, so that the urine could not get out of it as quickly as it came out of the latter passage. In cases of this description, the quantity which is ejected is less than what issues from the urethra, a portion of which lodges between the prepuce and the glans, and forms a tumour of greater or lesser size, according to the disproportion between the size of the urethra and that of the opening of the foreskin.* In consequence of this repeated distention, if nothing be done for the patient, the prepuce becomes so elongated, thickened, and relaxed, that its very size occasions considerable disfigurement. Sometimes, also, ulcerated openings are produced in it, from which, when it is compressed, the urine issues. In one such case on record, the swelling had become in a child two months and a half old, as large as a hen's egg, extending up to the symphysis of the pubes. The disease, which was not understood, was at first taken to be a cancerous tumour, that had destroyed the external parts of generation. As soon as its true nature was ascertained, the opening of the prepuce was dilated with a knife, when a large quantity of a clear gelatinous substance, with a small proportion of urine, was found lodged between the ulcerated glans and prepuce, and let out.† But the above described grievances are not the only ones; for, the irritation of the urine, and of the sebaceous matter confined under the prepuce, may not only excite inflammation and ulceration of the part, and cause a complete retention of urine under the prepuce, but preternatural adhesions between the glans and the prepuce may be produced, which may afterwards prove a serious perplexity in any requisite operation. It should also be well remembered, that the impediment caused to the discharge of the urine, by the contracted state of the prepuce, may give rise to disease of the urethra and bladder, especially to ulceration and paralysis.‡

* Petit, *Traité des Maladies Chir.* t. ii. p. 430.

† This case was originally communicated to the Academy of Surgery at Paris, and is quoted by Chopart in his *Traité des Maladies des Voies Urinaires*, p. 428.

‡ See Richter's *Anfangsgr.* b. vi. p. 191.

From what has been said, it is manifest, that the deformity of the prepuce may impede the functions of the penis: some of these functions must be performed from the time of birth; while others are not exercised before the period of manhood. In children it is absolutely necessary, that the opening of the prepuce should be at least equal in size to that of the urethra; and, in adults, the same opening must be such as will allow the glans readily to pass through it, even when the latter part is enlarged, as it always is when the penis is erected.

A woman brought a little boy, six years of age, to M. Petit: the opening of the child's prepuce was so small, that when he made water he suffered considerable pain. Petit desired to see him expel his urine; and as this fluid did not find its way out as fast as it issued from the urethra, the cavity of the prepuce was immediately filled with it, and a large swelling was produced, even before a drop had been voided externally. When the cyst was full, the child began to be in pain, and the urine to spirt out to a great distance, though in a very small stream. Petit operated on the boy, who was cured in a few days.

Another child was brought to Petit with the same disease, attended with a collection of urinary calculi in the cavity of the prepuce. One of these, about two lines in length, and shaped like a grain of oats, had insinuated its small end into the aperture of the prepuce, and thus intercepted the course of the urine. Petit tried to extract it; but it slipped away under the foreskin, and the child was then able to make water better. In this case, the operation was also done, the calculi taken out, and the boy cured in a very short time.

Another little boy, six years old, was born with the prepuce so much contracted, that he always made water with pain: For three years, this was his only inconvenience; and, though he suffered a good deal, he was habituated to it, as it were, and his parents were not alarmed.

It is to be remarked, that in all these cases, the prepuce continues full of urine, though there may be none in the bladder; and, in order to complete the evacuation, the children are obliged to empty the prepuce by squeezing it with their hand. However, they can never get out every drop, either because, when the prepuce is compressed, a part of the urine is forced back into the urethra, or because there are calculi within the prepuce, which hinder it from being exactly compressed, as was the case in the last-mentioned boy. Upon entering his fourth year, the difficulty of getting out the last drops of urine was so great, and the attempt accompanied with such pain, that he was afraid of going on with the experiment, and

consequently what was left oozed out by drops, and trickled down his thighs.

It was now perceived, that there was a calculus in the cavity of the prepuce, and that it could be pushed from one side to the other, without pain; but by degrees it got larger, and then its situation could not be changed, as it constantly remained fixed on one side of the frænum below the glans. Here it enlarged so much as every now and then to prevent the evacuation of the urine; and, when the boy was six years old, the difficulty of making water was urgent enough to render surgical assistance indispensable. Petit operated, and a complete cure was the result.*

OF THE ACCIDENTAL, OR PRETERNATURAL PHIMOSIS.

Such are the names applied to the cases of phimosis which are formed subsequently to birth, and usually arise from an inflammation and thickening of the prepuce, by which its aperture is considerably diminished, while, from the very same irritation that produces this effect, the glans penis is itself often swelled and turgid, by which the difficulty of making it protrude out of the constricted prepuce is naturally augmented.† It may be right to notice, however, that patients rarely become affected with an accidental phimosis, unless they have a natural disposition to the disease; and it was observed by the experienced Petit, that in such individuals as are troubled in this manner, the prepuce was naturally tight and very long.‡ When the opening of the prepuce is only just sufficient to let the glans pass through it, or when the glans cannot be made to pass through it without force, the prepuce sometimes cannot be brought forward again over the glans, and a paraphimosis is the consequence. Or, supposing the prepuce can be made to cover the glans again, the slightest inflammation, or the least swelling, will hinder the glans from

* For most of the foregoing correct, valuable, and practical remarks on the congenital phimosis, I am indebted to J. L. Petit.—See *Traité des Maladies Chirurgicales et des Opérations qui leur conviennent*, t. ii. p. 421—432.

† “Ce sont les chancres et les poireaux vénériens qui rendent le phimosis compliqué, &c. Le gonflement qu’ils attirent sur le gland et sur le prépuce augmente le volume de l’un et l’étroitesse de l’autre, de sorte qu’ils se gênent réciproquement.”—See Sabatier’s *Médecine Opératoire*, t. iii. p. 325. ed. 2. “*Speciales morbi causæ sunt omnia, quæ glandis volumen augent, aut tumorem, vel stricturam præputii inducunt.*—Callesen, *Syst. Chirurgiæ Hodiernæ*, vol. i. p. 281. Hafniæ, 1798.

‡ T. ii. p. 433.

being denuded, and thus a phimosis commences. But, says M. Petit, when the opening of the prepuce is very capacious, a certain degree of inflammation and swelling may prevail, without preventing the glans from being uncovered.

In persons whose prepuces have a wide and free opening, the irritation and inflammation must be considerable to bring on a phimosis. Every surgeon who has been in the habit of drawing back the prepuce to dress chancres, must be aware of this fact.

In general, ulcers do not produce a phimosis, except when they attack the prepuce itself, and particularly the margin of its opening. If the complaint has sometimes been brought on by chancres of the glans, it has almost always been when these sores have been situated upon the corona glandis, where the membrane of the prepuce is reflected, or else upon the frænum, which is only a duplicate of the same membrane.*

Phimosis is often brought on by severe gonorrhœa, and even by warts, when they are large and ulcerated. The same effect is also frequently produced by simple excoriations, which arise from the confinement and acrid quality of the sebaceous matter secreted round the corona glandis. A phimosis, with swelled testicle, has been known to originate from a blow †, though, on receiving information of such a cause, I should be very suspicious of a gonorrhœa being the original complaint. In short, both the phimosis and paraphimosis, which happen subsequently to birth, are occasioned by some species of irritation, producing a thickening of the cellular membrane of the prepuce, and sometimes also an increase in the size of the glans itself. ‡

The inflammation of the prepuce is sometimes violent, and of the erysipelatous kind; while, in other instances, the part has an anasarctous appearance, owing to the extravasation of serum.

As Mr. Hunter observes, a phimosis is not unfrequently the cause of very bad consequences, especially when it is attended with chancres behind the glans; for then the latter part, being situated between the sores and the orifice of the prepuce, may hinder the pus from finding its way out. The result is, that the discharge accumulates behind the corona glandis; this peculiar kind of abscess then excites ulceration on the

* Petit, *Traité des Maladies Chirurgicales*, t. ii. p. 454.

† Travers, in *Surgical Essays*, part i. p. 135.

‡ In children who have calculi in the bladder, the sympathetic irritation experienced at the glans penis, frequently makes them pull their prepuce, by which means it is very much lengthened, and disposed to phimosis.

inside of the prepuce, and, when it bursts, the glans often protrudes through the opening, throwing the whole prepuce to the opposite side.*

In the debilitated state of the system, produced by large quantities of mercury, as Mr. Travers remarks, cases now and then occur in hospital practice, in which the whole of the external organ, becoming affected with an erysipelatous inflammation, gangrenes, and falls off from the pubes, leaving only the vestige of the bulb, in the form of a fleshy tubercle, beneath the symphysis pubis, from which the urine is discharged.†

The same author points out the evils, which may arise in certain cases of phimosis from extravasation of the urine. In some instances, the tension of the parts is relieved by the sloughing of the glans penis, and the urine, insinuating itself into the elongated prepuce, gives rise to circumscribed ulcers of the part, by which it is discharged. In other examples, according to Mr. Travers, where the mouth of the prepuce is closed by adhesion, and a retention of urine ensues, ulceration, both of the prepuce and urethra, takes place, the urine is extravasated into the cellular membrane, and the body of the penis is sometimes denuded by gangrene even to the pubes. A state of phimosis is also described, where the swelling is excessive, so as to compress and partially stricture the urethra, and which, if unrelieved, tends to ulceration of the urethra, extravasation of urine, and gangrene.‡

In numerous books, written by very modern surgeons, we find it stated, that both phimosis and paraphimosis are commonly owing to the venereal disease. From the preceding account, however, it is sufficiently clear, that any cause, occasioning an inflammation and swelling of the prepuce, and a consequent diminution of its aperture, whether attended with an increase in the size of the glans, or not, may give rise either to a phimosis, or paraphimosis; and that, of whatever nature the cause may be, the effect itself is always quite free from syphilitic infection. In a word, it is a simple, inflammatory thickening of the prepuce, producing a diminution in the capacity of its orifice, so that when such orifice is in front of the glans, this part cannot be uncovered, and when behind, it cannot be covered again, and a more or less dangerous constriction is made round the penis by the contracted part of the foreskin.

* Hunter's Treatise on the Venereal Disease, p. 223. edit. 2.

† Surgical Essays, part i. p. 136.

‡ Ibid. p. 136, 137.

OF THE TREATMENT OF THE NATURAL, OR CONGENITAL
PHIMOSIS.

It is an established maxim in surgery, that, in these cases, no operation should be practised upon children, unless great inconvenience from the impediment to the discharge of the urine be suffered; for experience fully proves, that the constriction generally undergoes a natural removal as the patient approaches the adult age. The causes of this change I have already touched upon in the preceding part of this chapter, and, in addition to what has there been stated, it is to be recollected, that as, at this period, the organs of generation are undergoing considerable developement, the prepuce will the more readily accommodate itself to the size of the glans.

When, however, the prepuce is either imperforate, or so contracted in an infant, that the urine cannot be voided at all, or not without more or less pain, difficulty, and distention of the foreskin into a considerable cyst, the sooner an operation is performed the better. In the first case, indeed, the practice is immediately necessary for the preservation of life. Also, if the constriction of the prepuce does not disappear at the approach of manhood, but continues to be a serious obstacle to the additional function for which the organ is then designed, the surgeon should not hesitate to recommend an operation.

When the tightness of the prepuce is not very great, trials have occasionally been made to effect its dilatation with mechanical contrivances; and Trew, a practitioner at Nuremberg, invented an instrument with branches, which could be expanded more or less, and which were calculated for holding the part in a dilated state.* Lassus used this instrument with success on a young man who was about to be married, but could not be prevailed upon to bear an incision: it was unremittingly worn about three weeks, at the end of which time the constriction was obviated.† The plan, however, has generally been found much more painful than the use of the knife, and, being tedious and uncertain, has little or nothing to recommend it.

* *Acta Physico-Medica Acad. Naturæ Curios.* t. ii. obs. 48. p. 110. The instrument is represented in Heister's 26th Plate, fig. 5. vol. ii.

† *Pathologie Chirurgicale*, t. ii. p. 478. 8vo. Paris, 1809. In a similar case, a dilatation was effected by bathing the prepuce daily in warm milk, smearing it with oil of almonds, and pressing it back, for a certain time, very frequently. See Loder's *Chirurgisch-Medicinische Beobachtungen*, b. i. p. 90.

There are two methods of operating for the cure of phimosis; in one, the surgeon amputates the whole of the constricted portion of the prepuce, or, in other words, he performs circumcision; in the other mode, he slits open the prepuce by a simple longitudinal incision. In the generality of cases, the first practice is much better than the second, which always leaves two flaps, which are not only a disfigurement, but a real inconvenience, and sometimes an obstacle in coition. Indeed, the deformity of the prepuce, occasioned by this plan of operating, and the annoying friction to which the angles of the part are continually exposed, have been such as to make some patients desirous of having the prepuce united again. One patient, who was thus incommoded, was advised by Fabricius ab Aquapendente to submit to an operation resembling that for a harelip*; but the author does not state whether it was actually performed. Bertrandi, however, was acquainted with a surgeon at Paris, who endeavoured to reunite the part by means of the twisted suture; but could not succeed.† Such indeed are the unpleasant effects which often follow the operation of slitting open the prepuce, that the method is sometimes modified by combining with it the removal of the two flaps, or angles of the skin. The latter plan, however, can only be regarded as a less simple, and more imperfect and painful kind of circumcision. It is, in fact, a double operation. But I would not wish to be understood to say, that the amputation of the two angles is not necessary, nor advantageous, if the operation of slitting open the prepuce be adopted. On the contrary, I am inclined to think, that, under these circumstances, it is right, especially if the prepuce be very long as well as contracted. I believe, with Richter, that the proceeding, however objectionable on the score of pain, may avert a great deal of future inconvenience. If these angles be not cut off, they usually swell enormously after the operation, and it is sometimes a considerable time before the swelling abates. In certain instances, they remain in a permanently thickened and hardened state after the subsidence of the inflammation, and produce serious annoyance. Sometimes, also, as the process of cicatrization advances, the flaps partially reunite, and the prepuce becomes so tight again, that the glans cannot readily be uncovered. ‡

* De Chirurg. Operationibus, cap. 61.

† “Un chirurgien de mes amis, à Paris, ayant fait en pareil cas cette suture, eut le déplaisir, et le malade la douleur, d'en voir les points déchirés par un priapisme malencontreux.” *Traité des Opérations de Chirurg.* p. 238.

‡ Richter, vol. cit. p. 197.

As Richter observes, we may the more readily decide to give the preference to circumcision, because, in many patients, the prepuce is of extraordinary length from having been repeatedly distended with urine, and, after the operation, so considerable a portion of it still remains, that one can scarcely perceive that any of it has been cut off. Frequently, as Loder has remarked, the surgeon may remove half an inch or more of the foreskin, without the part being afterwards at all too short.* There are also instances to which the old method of slitting up the prepuce is inapplicable, and where circumcision is absolutely requisite. As examples of this kind, the following are adduced.

Sometimes, at the anterior opening of the prepuce, a small, hard, almost cartilaginous ring is perceptible, which is the only cause of the constriction, the prepuce being too narrow at no other point. Here it is obviously the best practice to cut away the whole of the circular induration, and not to be content with simply dividing it. Sometimes the extremity of the prepuce is not only preternaturally contracted, but thickened and converted into a sarcomatous mass. What effectual good would the surgeon here be doing by merely dividing the diseased part? The true indication is to cut the thickened mass entirely away. In other cases, the anterior part of the prepuce is for half an inch, or more, so contracted, that it resembles a small pipe, while the rest of it retains its natural form and width. Here all the narrow constricted part of the prepuce should be cut off, as the patient would derive little advantage, and be left with a serious deformity, were the part merely slit open. Sometimes the opening of the prepuce is so small, that no instrument can be introduced into it for the purpose of dividing it, in which case, circumcision should be preferred. Lastly, the prepuce is occasionally enormously enlarged from being repeatedly distended with urine, while its end is contracted. Here, by means of circumcision, the surgeon may cure not only the phimosis, but remove the superfluous portion of the foreskin; while merely slitting open the part would leave two large inconvenient flaps.†

* *Chirurgisch-Medicinische Beobachtungen*, p. 86.

† See Richter's *Anfangsgr.* b. vi. p. 192. Notwithstanding the numerous reasons, which are justly urged in favour of the removal of a portion of the prepuce in cases of natural phimosis, Richerand gives a preference to the old method of simply slitting open the prepuce, because, says he, circumcision would often be rendered ineffectual, by the difficulty of cutting through as much of the internal membrane of the prepuce, as of the outer skin. *Nosographie Chirurgicale*, t. iv. p. 331. edit. 4.

In all common cases of natural phimosis, the best modern operators in this metropolis, and many excellent surgeons abroad*, prefer circumcision. The prepuce is taken hold of with a pair of forceps, and as much of the part being left out as seems necessary to be removed, the surgeon cuts a complete circle of the prepuce off by one stroke of the knife, guided along the forceps as a pencil is along a ruler, and if the inner membrane of the prepuce should appear still to be too tight, it must be divided with a curved knife. The external skin of the part is then usually prevented from becoming separated from the inner layer by a fine suture, introduced through both their edges, and simple dressings are applied. In the cases which have fallen under my observation, it has seldom been necessary to tie any vessel. Bertrandi cut off the whole prepuce in three instances, but without any bleeding of importance.† A small linen cap, made to fit the part, will be found very convenient for keeping on the dressings; it is to be pinned to a bandage applied round the waist, and taken off when the patient has occasion to make water.

In applying the forceps, it should be recollected, that the upper part of the prepuce is quite unconnected to the glans, and longer than the lower part, which is also connected with the frænum; hence, the surgeon always finds it necessary to leave more of the upper portion of the prepuce out of the forceps to be cut off with the knife, than of that part of it which joins the frænum. Particular care should invariably be taken, however, to leave out for removal all such portion of the prepuce as is too tight, preternaturally thickened, redundant or diseased; for, if this object be not properly fulfilled, the inflammation subsequent to the operation will be liable to bring on a greater constriction, or even an entire closure of the prepuce, urgently requiring a second operation, which now must unavoidably be that of slitting open the part.‡

It is not a great many years, however, since the general practice was to slit open the prepuce with a narrow, sharp-pointed, curved bistoury, and it was in this way that the eminent M. Petit operated, in the cases to which I have requested the reader's attention in a foregoing part of this

* Richter, op. cit. Loder, *Chirurgisch-Medicinische Beobachtungen*, b. i. p. 86.

† *Traité des Opérations de Chirurgie*, p. 245. In a few instances, however, the hemorrhage proves troublesome; it may happen two or three days after the operation; and when it resists the usual means, constant pressure kept up with the finger will stop it. Loder, lib. cit. p. 86—88.

‡ See Richter's *Anfangsgr.* b. vi. p. 193.

chapter. The anterior part of the prepuce is first to be taken hold of with the left thumb and fore-finger, by which means it will be rendered tense, the requisite instruments be more conveniently introduced, and the part more easily divided. When the opening in the prepuce is very small, a probe must be introduced, and, with the aid of this, a grooved director: the probe is then to be withdrawn, the knife passed along the director as far as the corona glandis, and its point being pushed from within outwards, all such portion of the prepuce is to be divided by one stroke, as is within the grasp of the instrument. Sometimes, however, it is extremely difficult to cut through the part by a single stroke, because the knife, though very narrow and long, and guided by the probe, cannot be introduced without a good deal of trouble, and as soon as the patient feels its edge, he starts back, and hinders the completion of the incision. Here only a third, or a half of the prepuce is to be divided at first, and the incision is to be afterwards carried to the proper extent by means of the knife and director. Abroad, the latter instrument is sometimes dispensed with, and the knife is introduced flat, with its point enveloped in a little ball of wax: as soon as it has been introduced sufficiently behind the corona glandis, it is turned, so as to apply its back to the glans, and its edge to the prepuce, when its point is immediately pushed through this part, and the requisite division made. *

When the opening of the prepuce is large enough readily to admit the knife, the operation may be done with, or without a director, as the surgeon may prefer.

With respect to the best place for the longitudinal incision of the prepuce, some diversity of opinion prevails amongst surgical writers. Some recommend the upper part of the prepuce; others prefer one side of it †; and a few cut both to the right and left. It was the fear of hemorrhage, which mostly led surgeons to adopt the two latter modes of operating. ‡ But, as I happened to serve an apprenticeship to an hospital-surgeon, who was exceedingly partial to the method of slitting open the prepuce at its upper part, I can affirm with

* Petit, *Traité des Maladies Chir.* t. ii. p. 436.

† "It is much safer to make the wound on one side of the prepuce, than upon the upper part; for, I have sometimes seen the great vessels on the dorsum penis afford a terrible hemorrhage." Sharp's *Treatise of the Operations*, chap. ii.

‡ In cases of accidental phimosis, when there were sores, or warts under the prepuce, the place for the incision was determined by their situation, and if one division of the part was not enough, (which Sabatier says he never saw,) two were performed. *Médecine Opératoire*, t. iii. p. 326. edit. 2.

Petit, that the hemorrhage may always be stopped by proper management, and that it is not this consideration by which the situation of the incision ought to be determined.* The true reasons, by which a decision should be formed, are the advantages which are to be derived from one method or the other. If a longitudinal division of the prepuce is to be made, it is clear that it is more advantageous to let the incision be at the upper part of the prepuce, opposite the middle of the glans, than on one side. First, because the two flaps being equal, the glans can be more readily uncovered, than when one flap is small and the other larger. Secondly, because making one or two lateral incisions occasions greater deformity, and is prejudicial to the functions of the part. A single lateral cut can only divide one side of the glans, while the opposite side remains entirely concealed, without the possibility of uncovering it, particularly when inflammation and swelling exist, for then the thickening and induration of the prepuce diminish its flexibility. After the cure, the remaining deformity is found also to be an obstacle in coition, inasmuch as the prepuce is all on one side, and forms a mass of skin, which renders the introduction of the organ difficult, and even painful. Such deformity is still more considerable, when two lateral incisions have been practised, on account of the large flap left between the two cuts. Petit informs us, that he was consulted by several persons, who had had their prepuces slit open on one side, or both sides, and the annoyance which they suffered, made it requisite for them to submit to the following treatment.

When the prepuce had been slit open at both sides, the intervening flap was removed with a stroke of the knife; but when only one lateral cut had been practised, Petit introduced a bistoury under the flap, and divided it longitudinally at a point corresponding to the situation of the former incision on the opposite side; the operation was then finished, by detaching the piece of the prepuce, between the two cuts, altogether from the penis.†

* Vol. cit. p. 440. I am far, however, from meaning to question the accuracy of Mr. Sharp's statement, that very troublesome bleedings may ensue. On the contrary, I have seen them happen; but they were invariably stopped by pressure, and cold applications. In whatever way the phimosis is cut, the hemorrhage will sometimes be profuse, and break out again from time to time, for some days after the operation. We see from Loder's experience, that the hemorrhage after circumcision may be troublesome, but that it can always be stopped by pressure with the finger. See his *Chirurgisch-Medicinische Beobacht.* p. 85.

† Petit, *Traité des Mal. Chir.* t. ii. p. 441.

OF THE METHOD OF OPERATING, WHEN A PHIMOSIS IS COMPLICATED WITH ADHESION OF THE PREPUCE TO THE GLANS.

Although this case is more frequently the consequence of an accidental phimosis, which has been attended with inflammation, excoriations, and ulceration, than the congenital form of the disease, experience proves, that it may follow either case, when the parts are subjected to any causes capable of producing inflammation, &c. of the prepuce and glans. This complication of phimosis particularly deserves the attention of the practical surgeon, because it is an example, which, when an attempt at cure is deemed advisable, and the adhesions are extensive, or particularly situated, may compel him to deviate from the good general rule of giving a preference to circumcision. Or if that be inadmissible, the state of the disease may oblige him to abandon the approved maxim, of always making the longitudinal cut in the prepuce exactly in the centre of its upper part.

Petit had occasion to operate in two cases, attended with a good deal of difference. In one, the phimosis was not adherent to the whole surface of the glans, and a probe could be introduced between it and the prepuce, but all the anterior part of the prepuce being adherent to the glans, a probe could be passed in only at the side. Here Petit was obliged to divide the prepuce with a bistoury and director. The small flap was not adherent, but the large one was universally so, and it was necessary to detach it, by drawing it in one direction, and the glans in the other, which could not be done without considerable pain. The separation was accomplished partly by tearing the adhesions, and partly by cutting them. After the glans had been cleared as far as the corona glandis, the large flap was diminished, by removing part of it in the manner above related.

In the other case, neither a director nor a probe could be introduced, and the disease gave a vast deal of trouble and pain. Petit operated as follows: he made an assistant pinch up the skin of the prepuce on one side, while he did the same thing himself on the other side. He then made a longitudinal incision in the middle, through the prepuce down close to the glans, which, however, he avoided injuring. In order to discern the membrane of the glans better, the angles of the wound were now drawn in opposite directions, and, by patient and careful dissection, Petit succeeded in detaching the prepuce from the glans, without hurting the latter. The operation is acknowledged, however, to have been ex-

tremely painful, as the prepuce could not be separated from its connections without forcibly pulling it, and the proceeding is compared to the skinning of an eel.

Difficult as this operation was, it is admitted to be much more so, when the adhesions are firm and hard, in which case, the necessary separation can only be done with the knife, at the risk of injuring the glans, the hemorrhage from which may be troublesome. It is a kind of bleeding, which, as Petit has explained, is not to be stopped with a ligature, as the blood oozes from the innumerable pores of the spongy structure of the part; and must be checked by means of lint dipped in a styptic lotion, and pressure.

In dissecting the adherent prepuce from the glans, the rule is to incline the edge of the knife towards the former part, as it is next to impossible always to hit exactly the mid-point betwixt the two. *

When the operation is finished, the recurrence of adhesions is to be prevented by keeping between the prepuce and glans a sufficient, but not an immoderate, quantity of the softest lint.

Though the example of the celebrated Petit may be adduced as an authority for attempting to separate the prepuce from the glans, when the adhesions are so firm and extensive, that no instrument can be introduced, yet, from the candid statements of this experienced author, we find, that he could not do what he did without the utmost difficulty to himself, and pain to his patient. Hence, it may generally be as well not to be anxious to undertake an operation in these circumstances, and, except the patient be very urgent himself, it may be prudent at most only to make such an incision, as will suffice for removing any impediment to the exit of the urine. Richerand positively assures us, that experience has convinced him, that the operation for the relief of phimosis, in individuals past the age of puberty, is always ineffectual, when adhesions exist between the glans and prepuce. †

After the adherent prepuce has been detached, it generally happens, that small fragments of it remain connected to the glans. These sometimes disappear during the ensuing supuration; but, when they do not, they may often be got rid of by applying the powder, or a strong solution, of opium to them. ‡

When the prepuce, after being separated from the glans, is

* Petit, *Traité des Maladies Chir.* t. ii. p. 445—446.

† *Nosographie Chirurgicale*, t. iv. p. 329. edit. 4.

‡ Lassus.

found to be indurated and diseased, the best plan is unquestionably to amputate it without delay. *

OF THE TREATMENT OF ACCIDENTAL PHIMOSIS.

From the extensive sloughing, which I have frequently seen follow operations performed on the prepuce, during its inflamed and œdematous state, in cases of phimosis, I have no hesitation in asserting, that such practice is generally very injudicious and hurtful. If we exclude the particular instance, in which purulent matter accumulates under the prepuce, and cannot make its exit, except by an ulcerative process, an inflamed phimosis can rarely, or never, require the employment of the knife. The application of dressings to sores is never a sufficient reason; for, these may be washed and kept clean, by frequently injecting suitable lotions under the prepuce; and, if they are chancres, they will almost always heal, when thus treated, and mercury is exhibited, after the subsidence of the inflammation.

The cases, which require an operation, are such as are natural, and do not amend as the patient becomes an adult; such as occur without acute inflammation, and, according to all appearance, spontaneously; and others, which arise from the puckering of the prepuce, in consequence of former ulcerations.

The inflammation of the prepuce, occasioning an accidental phimosis, may depend upon various causes; for instance, simple excoriations, or superficial ulcerations caused by the confinement and irritating quality of the secretion from the sebaceous glands; the same effects, resulting from commerce with women affected with fluor albus: the inflammation and swelling of the prepuce and glans may also originate from a severe gonorrhœa; from the irritation of chancres, or other ulcers, especially those which are situated upon the inside of the prepuce, upon the frænum, or behind the corona glandis. The pressure and irritation of large warts, growing from the glans, are likewise another occasional cause of a phimosis, attended with inflammation.

All these examples, if neglected, or badly treated, may bring on extensive ulceration, and even mortification.

With respect to the treatment of the phimosis from simple excoriation, and the irritation of the natural secretions lodged under the prepuce, the principal indications are to wash away the acrid matter by injecting tepid water, or the diluted liquor

* Richter, Anfangsgr. b. vi. p. 196.

plumbi acetatis, and to have recourse to common antiphlogistic means; cold applications to the inflamed prepuce; or immersing the penis several times a day in warm water; rest; saline purgatives; low diet; and, if necessary, leeches and venesection. Great benefit, in all severe cases of phimosis with inflammation, may also be derived from supporting the part at an angle upwards from the symphysis of the pubes.*

The phimosis, originating from virulent gonorrhœa, chancres, or other sores, may require, in addition to local and general bleeding, warm emollient poultices, containing laudanum. Great relief will frequently be produced by the application of the steam of hot water, or of vinegar and spirit of wine, to the inflamed prepuce. But nothing is more essential, than the plan of repeatedly injecting tepid water under the foreskin, for the purpose of cleansing the sores, and washing away their discharge, or the matter which issues from the urethra; and, when the fluid is thrown out of the syringe, the orifice of the prepuce should always be gently compressed, so as to let the injection be made to fill and pass freely about between the glans and prepuce, before it is discharged.

In cases of chancres, Richter recommends a lotion, which is composed of twelve grains of opium, three grains of the submuriate of mercury, and six ounces of water. This is both to be injected under the prepuce, and applied to its outside, by means of linen kept constantly wet with † it. When the pain is very great, a solution of gum arabic, with a small proportion of opium, makes an eligible injection; but with respect to the addition of quicksilver to it, as suggested by Richter, I entertain much doubt of its propriety, or use.

In cases of gonorrhœa and chancre, a phimosis may often be foreseen and averted, by directing the patient to draw back the prepuce frequently, to wash and bathe the parts, keep himself perfectly quiet in a horizontal posture, and the penis directed upwards, means which are also proper when the phimosis has already commenced.

When a chancre is complicated with an inflamed phimosis, experience proves, that it is a most unnecessary and pernicious practice, to continue the exhibition of mercury, before the inflammation and swelling of the prepuce have abated. A modern surgeon, indeed, lays it down as a general rule,

* See Richter's *Anfangsgr.* b. vi. p. 200., Gotting. 1802.; and Travers in *Surgical Essays*, part i. p. 188.

† Richter, *Anfangsgr.* b. vi. p. 200.

that the constitutional administration of this mineral is always inadmissible, during the existence of active inflammation in cellular textures. * The truth of this observation, as far as the inflamed prepuce in cases of chancre is concerned, I have had many opportunities of ascertaining, and, I believe, that, next to the rash employment of the knife, nothing has a greater tendency to make the sore spread and slough. Besides, in deferring the exhibition of mercury under these circumstances, we need not be frightened with the idea, that the sores must continue to get larger, and that the constitution will become more and more infected; for, the recent investigations into the nature of syphilis, have fully proved its general curability without any mercury at all, and that, contrary to opinions once not unfrequently promulgated, it is not the character of this disease invariably to get worse and worse, and to proceed from one order of parts to another, with increasing malignity, though no mercury, and no particular medicines be administered. †

When the discharge from chancres or other sores is completely confined under the prepuce, Hunter sanctions the method of making a puncture into this peculiar kind of abscess with a lancet, and through this opening, suitable lotions may be injected. If no puncture be made, an aperture will be formed by ulceration, and through such opening the glans is liable to protrude, so as to throw the whole of the prepuce to the opposite side, and occasion serious deformity, as I have already explained. Should this change have already taken place, the best plan would be to divide the portion of the prepuce intervening between the natural and the ulcerated opening; for, unless this be done, there would be great difficulty in restoring the former of these apertures afterwards to its right position again.

When the inflammation, swelling, and constriction of the prepuce diminish, and the sores begin to heal, the glans should now and then be uncovered, in order to prevent the formation of adhesions. Richter correctly observes, that if this requisite precaution be neglected, the prepuce will sometimes become adherent at various points to the glans, and its orifice close so much, that the urine can hardly be discharged. In such a case, when the opening of the prepuce lies opposite that of the glans, the same author recommends us to introduce a bougie for the purpose of dilating it; but when it is

* Travers, Surgical Essays, part i. p. 131.

† See the first volume of this work, and Mr. Rose's paper in *Medico-Chir. Trans.* vol. viii.

situated laterally, more or less away from the orifice of the urethra, he considers the employment of the knife indispensable, though the difficulty with which the adherent parts are separable, is at the same time frankly acknowledged. *

It is particularly in cases where an obstruction to the urine arises from the effects of the inflammation and swelling upon the extremity of the urethra, that a proposal has been lately made to have recourse to a small elastic catheter, with a view of preventing ulceration of that passage. With this treatment are to be conjoined fomentations and emollient poultices. †

In phimosis with inflammation, the operation of dividing or amputating the prepuce, may be set down as invariably unnecessary, as long as the patient can void his urine, the matter find its way out, and the requisite injections be applied under the prepuce. Such operation is always exceedingly painful, because the part is not only inflamed, but very much thickened and elongated. It is a proceeding also objected to by Richter, on the ground that the fresh wound must increase the risk of the constitution becoming affected by the absorption of the virus; while it must undoubtedly increase the existing inflammation, and often bring on mortification. It is likewise in cases of this nature, that the troublesome bleedings mostly happen, the vessels being all preternaturally dilated, and turgid with blood. Sometimes, perhaps, when the purulent discharge has no outlet, and the cavity of the prepuce cannot have the necessary lotions thrown into it, an operation may be right; but then, as Richter says, the opening of the prepuce should merely be enlarged sufficiently to let the matter escape, and the injections enter, all extensive cutting of the part being still improper. How many times has it been my lot to see the prepuce slit open, for the sole purpose of examining and dressing the sores under it! How many times have I seen this erroneous practice followed by a rapid extension of the ulcers, sloughing, and loss of more or less of the penis! Sores under the prepuce seldom essentially require any particular dressings, the very presence of which, in this situation, frequently produces all the irritation of a foreign body; and, if the ulcers be kept clean, by the frequent injection of tepid water, and the inflammation of the parts be appeased by proper antiphlogistic means, the treatment is complete as far as local measures are concerned.

One motive for cutting off more or less of the prepuce

* Anfangsgr. b. vi. p. 200.

† Travers, Surgical Essays, p. 137, 138.

formerly in vogue, was the seeming advantage of being thus sometimes enabled, not only to remove the phimosis, but actually to take away the ulcer or ulcers, with the amputated part, when they lay near its internal or external edge; by which means it was conceived, particularly when the practice was adopted early, that the constitution might be saved from infection, and all need for a course of mercury superseded. This plan was commonly followed the latter part of the seventeenth century, by M. Corbis, the surgeon-major of the hospital at Lisle, under whom the celebrated Petit was a dresser. As in the patients treated in this way by Corbis, the wound healed up very well, and they were heard no more of, it was inferred by him, that the cures were permanent. Encouraged by the example of his preceptor, Petit next tried the same practice, at first with supposed success; but afterwards meeting with instances of secondary symptoms, he became disheartened, and no longer regarded the object of being able to cut off a chancre, as a valid reason for amputating the prepuce. *

CHAPTER XX.

OF PARAPHIMOSIS.

FROM what has been stated in the preceding chapter, the reader must already be aware, that by the term *paraphimosis*, surgeons generally understand that particular case, in which the prepuce is drawn behind the glans penis, where the narrowest part of it produces such a degree of constriction round the penis, as occasions, not only more or less difficulty in reducing the glans, but considerable pain, inflammation, and swelling, sometimes terminating, when the complaint remains for a certain time unrelieved, in the destruction of the latter part and also of the skin, including the prepuce, by a rapid species of gangrene.

Besides this form of paraphimosis, which is far the most interesting to the practical surgeon, writers comprehend under the same name other examples, in which the glans penis cannot be covered, merely because the prepuce is either too short,

* See Petit's *Traité des Maladies Chir.* tom. ii. p. 452, &c.

nor altogether wanting. These cases are essentially different from the former, inasmuch as they are never attended with any constriction behind the coronaglandis, nor of course with any urgent symptoms. This extraordinary shortness, or total deficiency, of the prepuce, is sometimes *congenital*, sometimes *accidental*, or the result of a more or less considerable loss of the part from circumcision, ulceration, or sloughing. When an individual is born with this kind of paraphimosis, it cannot be remedied by any applications or any operation; a fact which is now completely established, notwithstanding it may not tally with the opinions of some of the ancient surgeons.* A young man in this condition urged Petit to try the following experiment: a cut was made through the skin all round the middle part of the penis, and the integuments were then pulled forwards so as to cover the glans, and leave an interspace of nearly two inches between the edges of the circular wound. As there was a good deal of bleeding, the cut was dressed with dry lint, and the skin was confined over the glans by means of a strip of adhesive plaster. On the third day the dressings were taken off, and every thing seemed so promising, that both Petit and the patient had not the slightest doubt of ultimate success. Two circumstances, however, afterwards began to discourage the surgeon: first, in proportion as the wound healed, the space, which had been left without skin, became daily narrower; and secondly, the part of the integuments about the glans swelled up, and the artificial prepuce gradually receded. The end of the case was, that, after the part had healed, the patient was left without any advantage whatever from the operation, excepting the satisfaction of having had a sort of prepuce for about a week; and for more than a year the penis remained considerably deformed, the skin near the glans being swelled up in the form of a circular thick knob, while the place of the cut was a long while constricted by an indurated cicatrix. Petit observes, that he should not have attempted the preceding experiment, had not the parts been in a very favourable condition for it, such as is rarely met with in persons whose prepuces are wanting. In this patient, the frænum was very long; and it is well known that the majority of individuals born without a prepuce, are also born without a frænum, while the orifice of their urethra is seldom situated in the centre of the glans, but in the place where the root of the frænum ought to be. Here the skin is also very delicate, and all the cir-

* " Si glans nuda est, vultque aliquis eam decoris causa tegere, fieri potest." Cornel. Celsus, lib. vii. cap. 25. Paulus Ægineta, lib. vi. cap. 53.

cumference of the mouth of the urethra is like a hollow cicatrix, as if there had been previous ulceration. Under such circumstances, the operation would not have been practicable, because after the circular incision had been made, the skin, being adherent to the orifice of the urethra, could not have been drawn forwards over the inferior portion of the glans.*

Under the head of congenital paraphimosis, we may also notice a malformation, which consists of a fissure extending through the whole length of the prepuce, attended with considerable inconvenience. Petit used to treat such cases on a similar principle to a hare-lip, with this difference, that he did not pare off all the edge of each fissure, but only the part of it where the prepuce was ample enough to meet and cover the glans with perfect ease, and a small portion of the margin of each side of the fissure towards its extremity was left untouched. This method was adopted, lest the malformation should be converted into a phimosis. The part of Petit's work which treats of these cases being imperfect, we are left ignorant of the degree of success which attended this treatment; but, from what has been stated in the preceding chapter, we must be aware, that the experiment would be liable to failure, were an unfortunate erection to disturb the parts placed together for the purpose of union.

OF PARAPHIMOSIS ATTENDED WITH CONSTRICTION.

This case frequently follows the phimosis, in consequence of the thickened and contracted prepuce being drawn back quite behind the glans, and not being immediately restored to its former situation again; or it may be induced by a naturally tight prepuce being forced behind the glans in coition, &c. In these circumstances, the constricted part of the prepuce acts as a tight ligature round the body of the penis, and seriously obstructs the return of blood from the glans, and from the portion of the prepuce which is beyond the stricture. Hence, the latter part is attacked with a considerable degree of œdematous inflammation, while the glans itself becomes greatly inflamed, its distention hourly increases, and if speedy relief be not afforded, the parts are at length threatened with gangrene. When mortification takes place, however, it is generally the glans alone which is destroyed, and the dead part separates without further mischief; the sloughing not easily extending to the corpora cavernosa. In some instances,

* See Petit's *Traité des Maladies Chirurgicales*, t. ii. p. 472—475.

the prepuce sloughs, including that part of it which is directly concerned in producing the strangulation, and thus a kind of natural removal of all the cause of suffering, inflammation, and mortification is effected.

A simple paraphimosis, arising merely from the retraction of a tight prepuce, and not from a venereal cause, is not attended with so much risk of mortification of the glans, as is generally supposed. Loder furnishes us with an example, where the operation was not performed before the glans had been strangulated eleven days, and yet it had not sloughed. *

As Mr. Travers has very correctly observed, both the phimosis and paraphimosis occasionally arise from circumstances wholly unconnected with sexual intercourse, and, in proof of this statement, he quotes a remark from Mr. Latta. "Young boys frequently bring on a paraphimosis by retracting the prepuce in diversion, until they become unable to pull it forward again. As they conceal this for some time through fear, it is not uncommon for the parts to become inflamed and swelled to a great degree, and I have even found gangrene taking place, before the matter was found out."†

In cases of paraphimosis, the disease rarely ends in sloughing, except the treatment has been injudiciously conducted, or the patient has long neglected to apply for surgical assistance. In general, also, the pain of the complaint, and the obvious inconvenience and deformity of a permanently exposed glans, and enormously enlarged prepuce, bring the disorder sooner than a phimosis to notice, while it is so easily reduced by the aid of timely scarifications of the swollen prepuce, fomentations, and compression of the glans, that it is rarely suffered to remain unrelieved.‡

TREATMENT OF PARAPHIMOSIS WITH CONSTRICTION.

In the treatment, the principal indication is to remove the stricture behind the glans as quickly as possible. Upon this point all surgeons may be said to be unanimous; but, with respect to the best and safest mode of accomplishing this desirable object, a difference of opinion prevails, some practitioners being advocates for the very early use of the knife for the division of the stricture, and others sanctioning this practice only when other means have failed.

* Loder, *Chirurgisch-Medicinische Beobachtungen*, p. 90. 8vo. Weimar, 1794.

† Latta's *Surgery*, vol. i. p. 391.

‡ Travers, *Surgical Essays*, part i. p. 134.

The disease may very often be at once relieved, by compressing as much of the blood as possible out of the glans penis, and then pushing the part back again through the stricture. In order to perform this operation adroitly, the surgeon should first make continued pressure on the glans, by placing it between the ends of the thumb, index, and middle fingers, of each hand. The whole surface of the part should thus be gradually compressed, at the same time, for the space of four or five minutes. Then, the two thumbs are to be employed, both in pushing backward the diminished glans, and, together with the fingers, in drawing forward the prepuce.

The success of the preceding method is found also to be materially promoted by immersing the whole penis for some time before the attempt at reduction is made in ice-cold water, until the size of the part, and more especially of the glans, is considerably lessened.* In confirmation of the excellent effects of cold applications in facilitating the reduction of the glans in an early stage of the disease, we have also the testimony of Callisen†, who assures us, that, with respect to emollients, unless they quickly afford relief, they do harm. It is very common, however, to see practitioners of eminence and talent prefer in these cases warm applications to cold; and fomentations, scarifications of the swelled prepuce, or leeches applied near it, venesection, compression of the enlarged glans, and other common antiphlogistic measures, may be said to form the outline of the ordinary treatment of paraphimosis; nor can it be doubted, that the plan is generally successful. At the same time, I believe, that at least an equal degree of success would be experienced, if ice-cold water were substituted for the fomentations. However, I would not, at first, expend any time in the use of local remedies, but proceed at once to the reduction of the glans by compression in the manner above related; and if this attempt were unsuccessful, the other means should be resorted to without delay.

I observe, that Richter asserts, that the attempt to reduce the glans by compression, and drawing forwards the prepuce, rarely succeeds; but, this is a remark entirely at variance with what I have seen, and I should suppose it must rather have originated from the learned professor's predilection for the speedy use of the knife in these instances, than from positive experience. His candid opinion is, that the trial is hardly worth the trouble, because a cutting instrument affords

* Hunezousky. See Richter's *Anfangsgr.* b. vi. p. 207.

† Callisen, *Syst. Chirurgiæ Hodiernæ*, vol. i. p. 285, Hafniæ, 1798.

immediate and certain relief, without any material pain, while delay lets things become worse and worse. He assures us, that, at all events, the manual endeavour to reduce the glans is proper, and likely to succeed only at first, before inflammation has supervened, and, that when the parts are inflamed, the experiment is both unavailing, and hurtful. The inflamed prepuce, he says, is adherent, swelled, and quite fixed behind the glans, so that even when it is previously divided, it cannot be brought forwards; and the attempts to do so, are exceedingly painful, and seriously increase the inflammation and swelling. Instead of this practice, therefore, when the paraphimosis is originally of the inflammatory kind, Richter enjoins early venesection, and other antiphlogistic means; and when the case proceeds from a venereal cause, the use of opium is highly commended.*

As I have already observed, this well-informed surgeon is very partial to the early use of the knife, as the surest and most expeditious mode of relieving paraphimosis after the disease has attained a certain degree. In doing this operation, the surgeon is to remember, that the narrow opening of the prepuce usually lies, like a tight cord, in a depression extending round the penis, while the glans, and the portion of prepuce which is situated between the glans and the constriction, is placed behind the latter part, in the form of a thick swollen mass of flesh, so that it is frequently quite impossible to introduce any knife under the stricture, for the purpose of cutting it in the direction from within outwards. As Richter says, the attempt could not be made without risk of wounding the corpora cavernosa; an accident which may be followed by serious inconvenience, the wound not closing, and a protrusion of a spongy substance ensuing, which gradually gets larger and larger, and at length becomes an impediment to coition.†

The best way of performing the operation is to lift up into a fold the skin of the penis, close behind the stricture, where it is always loose and moveable, and then to cut through the part which is raised. A small blunt-pointed director is next to be introduced through the wound into the cellular substance, and carried forwards under the constriction, until its extremity can be plainly felt on the side towards the end of the penis, when the surgeon is to cut into the groove of the instrument, and thus divide the stricture. After the constriction has thus been obviated, the prepuce cannot always be immediately brought forwards over the glans, and, perhaps, in

* Anfangsgr. b. vi. p. 207.

† Vol. cit. p. 205.

cases where the operation has been absolutely necessary, it is never at once practicable. Here, as Richter observes, the prepuce is usually so inflamed, indurated, thrown into adherent folds, fixed, and enlarged from the effects of the constriction, that every endeavour immediately to cover the glans with it must be fruitless. The attempt is also unnecessary: it is quite enough that the constriction has been removed; and the surgeon need not be in a hurry to cover the glans. From the moment when the operation is finished, the symptoms begin to subside; and, as soon as the inflammation and swelling have entirely disappeared, (which change, however, is sometimes slowish,) the prepuce falls spontaneously over the glans.*

CHAPTER XXI.

AMPUTATION OF THE PENIS.

IT is very generally set down, in surgical books, that cancer, either in the form of incurable excrescences, or malignant ulceration, and mortification† of the penis, are the two cases for which this operation is required. That the first disease is frequently a proper reason for amputating the penis, is unquestionable; but, that mortification is so, every reflecting surgeon will deny. The mortified part will separate, and the living surface cicatrize afterwards, fully as well, as if the patient were to submit to a painful operation.

I am glad to have it in my power to adduce, in support of the foregoing remark, the sentiments of the experienced and judicious Loder, who unequivocally declares, that, in exam-

* See Richter's *Anfangsgr.* b. vi. p. 206. "The œdematous swelling of the prepuce, (says Loder,) sometimes prevents, for a couple of days, this part from being put over the glans, though the stricture has been completely removed by the operation. By the continued use of the diluted liquor plumbi acetatis, this swelling may be got rid of; but, should it last longer, a scarification or two with a lancet will be requisite." See Loder's *Chirurgisch-Medicinische Beobachtungen*, p. 87.

† In mortification from paraphimosis, or other causes, the operation is recommended both by Heister, (*Institut. Chir.* 816.) and B. Bell, (*Syst. of Surgery*, vol. i. p. 538.) Richter deems the operation unnecessary for the separation of the sloughs; but thinks the knife may sometimes be requisite for making the end of the stump equal, when it has healed with inequalities. However, here beauty seems to me a subject not worth considering, at least in a surgical point of view.

ples of mortification, he would never undertake the operation. When the gangrenous mischief, says he, is spreading, amputation will be of no use, because it will not stop the disorder; but if the mortification has ceased to extend itself, the operation will be superfluous, as nature herself will throw off the dead parts. He adds, that he would rather recommend such a proceeding with a view of averting mortification, where the penis, or the glans, has been so injured and crushed, by external violence, as to leave no chance of the preservation of the part.* Sabatier†, who condemns amputating the penis in cases of mortification, for the very same reasons which are assigned by Loder, conceives, that it is a measure that may be useful in another circumstance: perhaps, says he, it might have been the means of saving the life of the young man mentioned by Albinus.‡ His penis having been forcibly bent while it was strongly erected, a tumour followed, which was attended with no change in the colour, or moveableness of the integuments. At first, pressure made it entirely disappear; but afterwards, its subsidence was only partial. As it was very soft, it was mistaken for an abscess, and applications used for the purpose of bringing it forwards. Under this treatment the swelling increased very considerably, and, in opposition to the advice of Albinus, it was at length opened, when a profuse hemorrhage arose, which could hardly be stopped, and in the course of a few days, the patient lost his life from a recurrence of the bleeding. Dissection evinced that the case had been an aneurism of the corpus cavernosum, which might have been known earlier, had due attention been paid to the smallness, flaccidity, and softness of the tumour, when the penis was not in a state of erection, and to the increased size and hardness of it at other times.

When the case is a scirrhus, or cancerous disease, the prospect of a perfect cure will greatly depend upon the testicles, skin about the pubes, and glands in the groin, being free from induration. I have now seen this operation performed three times, and in the first instance, the disease had extended to the testicles and inguinal glands, so that though the patient got rid of the disease situated on the penis, the disorder continued to increase in the groin and scrotum, until life was exhausted.

As the serious mistake has sometimes happened, of amputating the penis for a disease, which, on further examination,

* Loder, *Chirurgisch-Medicinische Beobachtungen*, p. 79.

† *De la Médecine Opératoire*, t. ii. p. 303. Paris, 1810.

‡ Annot. Anatom.

appeared to be of a very simple and curable nature, surgeons cannot be too cautious in the investigation of the circumstances of the complaint for which the operation is proposed. In particular, as Mr. C. Bell has remarked, they must carefully distinguish the cancerous disease of the penis from the more common warty excrescence. "I have seen, (says he), a man just about to lose his penis, on account of a combination of phimosis with these warty excrescences from the glans, and which had burst through the prepuce with a very malignant-like distortion. But the prepuce being freely cut open, the luxuriant crop of harmless warty excrescences started forth." *

It is certainly true also, that the penis has been cut off, when the prepuce was the sole diseased part. What are commonly (but as I conceive incorrectly) termed *venereal warts*, are well described by the latter writer: they have a spreading, mushroom-like top, and slender base; and if the intermediate parts can be seen, they retain their natural appearance. A tubercle, formed on some part of the prepuce, is often the beginning of cancer of the penis: it is at first, as Mr. C. Bell remarks, an irregular warty excrescence, with a broad base in the substance of the prepuce, or on the frænum. In a more advanced and ulcerated stage, the sore is of a dark red colour, covered with a sanious discharge; its bottom is solid, and deep excavations, and irregular cauliflower excrescences, present themselves. The neighbouring skin, of a purple colour, indurated, swelled, and tuberculated, stands out from the sore, while its irregular edge is turned inwards. The discharge has a peculiar smell, being highly offensive, and when the urethra is ulcerated, the urine gushes out from preternatural openings.†

Cancer may also commence upon the glans, as happened in the very first case, in which I had an opportunity of seeing amputation of the penis done. The disease here also usually begins in the form of a wart, or small, not very troublesome, induration, which gradually changes into a most painful ulcerated excrescence. Sometimes, as Richter informs us, the greater part of the penis is covered with such excrescences, the cancerous nature of which is particularly indicated by the deep extension of their bases into the substance of the parts from which they grow, the parts appearing for some depth to be converted into a similar hardened mass to themselves. I have seen the whole glans, and part of the corona cavernosa ‡,

* Operative Surgery, vol. i. p. 130. 8vo. Lond. 1807.

† See C. Bell's Operative Surgery, vol. i. p. 131.

‡ See also Case in Hey's Practical Observations in Surgery, p. 463. edit. 2.

changed, in this manner, into a firm incompressible substance, which had been gradually extending itself for years, the glands in the groin being also diseased in the same way.

Sometimes, after the prepuce has been slit open in one or more places for the relief of a congenital phimosis, a large irregular fungus sprouts out from the extremity of the penis, and continues spreading until it has occupied all that part of the organ which naturally projects beyond the scrotum. Frequently, in these circumstances, neither the prepuce nor the glans can be distinctly perceived; but the whole projecting part of the penis forms a confused mass of irregularly granulated flesh, discharging a very fœtid matter.* It would appear, from several of the cases recorded by Mr. Hey, that tubercles, or excrescences, actually existed within the prepuce before the operation, and were found there as soon as the phimosis was cut.† What is likewise remarkable, is the great frequency with which the cancerous disease of the penis seems to be attended with, or preceded by a congenital phimosis. Mr. Hey found this to be the case in seven out of nine examples which fell under his notice, and (says he) "where I had an opportunity of seeing the disease in an early stage, the phimosis evidently appeared to have been caused by an unnatural formation of the internal membrane of the prepuce; and this formation seemed also to have given rise to the cancerous affection."‡ The facts brought forward by this gentleman tend also to prove, that this malignant affection mostly commences upon the prepuce, and that, in its earliest stage, the whole lining of that part is studded with minute tubercles, or inequalities, which change into the worst kind of disease.

According to the observations of Mr. Travers, a malignant ulceration of the prepuce and penis, following phimosis, and requiring amputation, may be brought on by an indiscreet perseverance in the use of mercury during the period of inflammation; and one example is detailed which well illustrates the kind of case alluded to by the author. ||

Whenever excrescences on the penis have a narrow base, they may be cured by cutting them off, and the amputation of that organ is totally unnecessary, and of course improper.§ This I consider more judicious treatment, than applying to them a solution of the oxymuriate of mercury and opium for

* See Case in Hey's Practical Observations in Surgery, p. 461. edit 2.

† See Cases, p. 463. 473, &c.

‡ Op. cit.

|| Surgical Essays, part i. p. 152.

§ Richter, Anfangsgr. b. vi. p. 183. Gottingen, 1802.

their cure, under the idea of their being venereal. Also, when the wart or excrescence is of a malignant kind, but limited to the prepuce, a cure may generally be effected by a removal of the part, without touching the glans or body of the penis itself. * Lastly, it is to be recollected, that diseases of this organ, which had put on a most malignant appearance, have been sometimes cured by the carrot-poultice †, and the internal and external use of arsenic.

In the operation, the plan of saving as much of the penis, and also of the glans, as circumstances will allow, with due regard to the entire removal of every particle of the disease, is undoubtedly entitled to commendation; because the longer the stump is left, not only the more conveniently will the urine afterwards be discharged, but even the faculty of generation may still be preserved. In confirmation of the latter point, the testimony of Heister might be adduced, and Loder mentions one example in which the patient retained the power of propagating after the amputation of the whole of the glans. ‡

It is observed by the most experienced surgeons, that the amputation of a cancerous affection of the penis often effects a cure, relapses being much less frequent than after the generality of operations for the removal of cancerous parts. In the three first cases published by Mr. Hey, the cure after the operation was permanent. || In order to ensure this success, however, it is essential not to defer the use of the knife until the disease is no longer local, and the whole of it cannot be taken away. Hence, before determining to operate, it is a rule with surgeons carefully to examine whether the disease has extended to other parts, especially the glands in the groin. When they are indurated and enlarged, many good practitioners decline the operation altogether, the event of which is then always to be regarded as doubtful and precarious. Thus, in one instance, in which the glands of the groin were much tumefied, Mr. Hey ventured upon the operation, because the swelling of the glands did not exist before escharotics had been applied to the disease of the penis, and consequently it was dubious whether their enlargement was truly cancerous or not; but the patient died from a relapse. The inguinal glands lessened for a time, but afterwards increased considerably: there was, however, never any fresh ulceration. §

* See Case proving the truth of this remark in Hey's Practical Observations, p. 473. edit. 2.

† Gibson, in Med. Observations and Enquiries, vol. iv.

‡ Loder Chirurgisch-Medicinische Beobachtungen, b. i. p. 81.

|| Hey's Practical Observations in Surgery, p. 478. edit. 2.

§ Op. cit. p. 470.

Sometimes the only part affected, in addition to the penis, will be the integuments covering the ossa pubis, in which situation a hard tumour is perceptible. In one case of this description, operated upon by Mr. Hey, a permanent cure ensued, care having been taken to cut out the swelling alluded to: the wound at the pubes remained for some time foul; but, by applying to it a powder composed of red precipitate and burnt alum, it was made to look better, and it afterwards healed.* The operation is one of the most simple in surgery, though attended with more or less danger and difficulty, according as the part of the member to be removed is considerable, or otherwise. The degree of immediate risk depends also very materially upon the manner of doing the operation, and more particularly upon the method adopted for securing the blood-vessels. When the cancerous disease does not extend beyond the glans, immediately behind which the incision can be safely executed, there is no objection to the method of cutting through the whole of the penis, skin, corpora cavernosa, &c., with one stroke of the knife. However, in order to cover the ends of the corpora cavernosa with integuments, the plan is sometimes followed of first drawing them towards the pubes, before the incision is made, or else of first merely making a circular cut through the skin, which is next pushed a little way up towards the pubes, and then the rest of the penis is divided in a line with the edge of the retracted skin. This last way of operating, however, is not approved of by the generality of modern surgeons; for it is slower, and more painful, than a direct incision through the whole organ; it does not shorten the cure, and is liable to inconveniences. If, indeed, the preservation of skin for covering the end of the stump were any real advantage, the surgeon would always have enough for this purpose by cutting straight through the part, because the corpora cavernosa constantly shrink up towards the pubes as soon as they are cut through, and leave the integuments projecting. But the truth is, there is no benefit derived from the redundancy of skin: in one case, Mr. Hey made an attempt to heal the wound by the first intention, and, with that view, brought the integuments over the divided corpora cavernosa, and, that he might make the integuments lie over the end of the penis without puckering, or covering the orifice of the urethra, he made a longitudinal division of them at the inferior part of the penis, and introduced a small silver cannula into the urethra. "I was dis-

* Op. cit. p. 465.

appointed," says he, "in my design of healing by the first intention; for the integuments would not adhere to the extremity of the corpora cavernosa. These spongy bodies, when divided, do not readily throw out granulations; but have usually for some time an ill-conditioned appearance." * The objection of a more serious nature against amputation of the penis by the double incision, is, that the superfluous flap of skin, further augmented by the natural retraction of the divided corpora cavernosa, renders it more difficult to secure the blood-vessels, which become concealed under it, and are here themselves much more disposed to retract, than in the generality of other situations, on account of the loose cellular substance with which they are surrounded.† At all events, if the surgeon choose to save the skin, let him not prolong the patient's sufferings by two formal distinct incisions, with an intermediate dissection of the integuments from the corpora cavernosa, as it will be quite sufficient to draw the skin a little way towards the pubes, before the amputation is performed with one single stroke of the knife.

When the penis is to be amputated near the symphysis of the pubes, the corpora cavernosa usually retract so considerably after their division, and lie so deeply concealed within the integuments, that the surgeon cannot discover, nor take up the bleeding vessels. In one example, says Richter, the arteries shrunk so far under the pubes, that they lay two inches within the extremity of the skin. Hence, in such an operation, instead of saving integuments, the surgeon should make a point of removing more of them, than of the corpora cavernosa. This may always easily be accomplished, if the skin be drawn forwards towards the glans before the requisite division of the parts is performed; and if there were any difficulty experienced, it would be right to make the incision through the skin first, and cut through the rest of the penis afterwards, in such manner, as will guard against too considerable a retraction of the corpora cavernosa.‡

As the hemorrhage after amputation of the penis is profuse, and often cannot be effectually restrained, unless the larger arteries are secured with ligatures, it is a matter of great importance to do the operation in such manner, as will enable

* See Hey's Practical Observations in Surgery, p. 469. edit. 2.

† "It requires (says the late experienced Mr. Hey) great care in this operation to secure the larger arteries, as they are apt to shrink and conceal themselves under the loose integuments, to which they have no strong attachment." Practical Observations in Surgery, p. 478. edit. 2.

‡ Richter, Anfangsgr. b. vi. p. 185, 186.

the surgeon to get at these vessels with the least difficulty; and hence the utility of abandoning the project of saving skin for the purpose of covering the stump. Without this precaution, as a modern surgeon has remarked, while the tedious business of getting the ends of the corpora cavernosa from beneath the integuments, by which they are concealed, and of finding out the arteries is going on, the continued bleeding often reduces the patient to the lowest state of weakness, and the practitioner is at last compelled to have recourse to compression, styptic applications, cold water, or the cautery. Nor are these means always capable of stopping the hemorrhage in time, or in a permanent manner, the effusion of blood ceasing only for a little while; and, by their irritation, they always increase the inflammation of the stump, and protract the cure with a tedious suppuration. Thus, in one example, where the hemorrhage was considerable, the blood not only flowing from many conspicuous arteries, but oozing largely from the divided corpora cavernosa, the experienced Mr. Hey took up one artery on the dorsum penis, and one in each corpus cavernosum. The bleeding, which still continued, seemed then to be a general oozing from the wound: on which account he applied sponge in the manner recommended by Mr. White. But this would not do; for, about an hour after the patient had been put to bed, the bleeding burst out again, and Mr. Hey was therefore obliged to remove the dressings and take up three other arteries. A fourth vessel, which run near the urethra, bled a little; but as its extremity could not be clearly seen, a piece of sponge was laid upon it. On the third day a fresh hemorrhage came on, which made it necessary to remove the last portion of sponge, and take up the vessel under it, which now bled freely.* In another example, Siebold could tie only one artery, the others having shrunk so deeply, that they could not be discovered. After the patient had fainted, the bleeding stopped, but it broke out again, and was at length effectually checked with cold water. The weakness from loss of blood was such, however, that the patient was a month in recovering his strength, and his feet continued for some time to be œdematous.† In another instance, related by Sabatier, pressure with a bandage answered so badly, that the blood found its way into the bladder‡ under the dressings, or (I should rather suppose) flowed out profusely when the patient

* See Hey's Practical Observations in Surgery, p. 465. edit. 2.

† Chir. Tagebuch, p. 52.

‡ Médecine Opératoire, t. ii. p. 506. ed. 2.

made water. Joerdens saw a case, in which the stump became retracted under the pubes, and a violent hemorrhage ensued, which nearly proved fatal: it gave a great deal of trouble; and the effusion of blood could hardly be restrained in half an hour, by tying three arteries, and having recourse to compression, and a styptic liquor.* Benjamin Bell was still more unfortunate; for he ventured to trust entirely to pressure, without taking up any of the vessels: the consequence was, that so copious a bleeding came on a few hours after the operation, that the patient lost his life.† In another case, the surface of the stump, which had been treated with compression and styptics, was long ill-conditioned, pale, and indurated, nor did the wound begin to diminish at all before the thirteenth day‡, in which space of time, another instance, treated differently by Schreger, had completely healed.§

It appears that the corpora cavernosa have the greater tendency to retract, the nearer their division is to the pubes; and, on this account, it is alleged, that even when care has been taken to amputate more of them than of the integuments, their extremities will still frequently be deeply concealed, and the taking up of the arteries be a matter of great difficulty. Nor will the plan of encircling the stump with a tight piece of tape here avail in obviating the disadvantage of the retraction of the corpora cavernosa, and the immediate danger of hemorrhage, as the stump is short, and the band therefore liable to slip off. Even if the band could be fixed tightly on the part, it would only serve as a temporary means of stopping the bleeding, which would be renewed immediately the band was loosened for the purpose of enabling the operator to see the points from which the blood issues, so as to get at the vessels.|| This plan, however, has been adopted with success in Germany¶, and even Mr. Hey assures us, that, in one of his cases, he found great advantage from having applied some tape round the sound part, as he was thereby not only enabled to divide the integuments more easily and correctly, but was furnished with an useful kind of tourniquet, which kept the divided vessels from bleeding, till he was prepared to take them up with the tenaculum and ligature.** With regard to abandoning the use of ligatures altogether, and trusting to circular pressure, as suggested by

* Loder's Journal, 3 b. 1 st.

† Syst. of Surgery, vol. i.

‡ Schmalz in Loder's Journ. 1 b. s. 622.

§ See Schreger's Chirurgische Versuche, b. i. p. 243. || Ibid. p. 247.

¶ Ollenroths, in Hufeland's Journ. 3 b. s. 56.

** Hey's Practical Observations in Surgery, p. 478. ed. 2.

Ollenroths, it would be renouncing a certain for an uncertain means.*

Since, therefore, the ligature is the surest thing for stopping arterial hemorrhage, it must be highly important that the vessels should be secured in this manner, without exposing the patient to a tedious debilitating hemorrhage at the time, or to the danger of its renewal afterwards. This is proper, not only in cases where the stump is short, but also in those where it is long, and the surgeon has it in his power to limit, in some measure, the retraction of the corpora cavernosa, and place their extremity on a level with the edge of the skin.

In order to be able always to tie the vessels without delay, Schreger has devised a new method of operating. In amputation of the penis, the surgeon may have to tie, in addition to lesser cutaneous branches, the arteriæ dorsales penis, which lie together; two in the middle of the penis, that is to say, one in each corpus cavernosum near the septum penis, usually called the arteriæ profundæ; and below two arteries which run together in the corpus spongiosum urethræ, the arteriæ cavernosæ urethræ. Having drawn the integuments as much forwards as possible, and fixed them there with a tape, Schreger begins with making an incision behind the tape, but only cuts just deep enough to be able to see the blood issue from the divided arteriæ dorsales, which he immediately takes up with a tenaculum, and sets one of the assistants to tie. He then cuts straight down through the middle of the corpora cavernosa, until he sees the blood gush out of the two arteriæ profundæ, which he secures in the same manner. Lastly, the third sweep of the knife cuts the corpus spongiosum and its arteries, without, however, dividing the urethra completely through: then the arteries of the spongy substance are tied, and the part is afterwards entirely severed.† Thus the operator, by leaving a portion of the penis below undivided, until all the arteries are secured, hinders the premature retraction of the part, and all the risk and trouble arising from that occurrence.

Respecting the advantages of the foregoing method, in facilitating the ligature of the vessels, I can offer no decided opinion, because the proposal is new, and I have not yet had an opportunity of seeing it tried. At present, were I to be called upon to amputate the penis near the pubes, I should give a

* Schreger, vol. cit. p. 247.

† See Schreger's *Chirurgische Versuche*, b. i. p. 249. The author subjoins to the preceding account the details of a case, in which he put the new method to the test of experiment.

preference to the mode in which the integuments are drawn forwards, before the incisions are begun.

Were a case to present itself, in which the mouths of the arteries could not be found and taken up, the practitioner would be compelled to resort to means, which experience proves to have occasionally succeeded under similar circumstances; as, for instance, compression *, with agaric, sponge, or lint dipped in powder of gum arabic; ice-cold water †, and the actual cautery ‡, a circular band, strip of plaster, or tourniquet, &c. The uncertainty of all these methods, however, is now generally acknowledged, and nothing can be depended upon except a ligature, when large arteries are concerned, and hence a trial of them is only justifiable, as a matter of necessity, when the vessels cannot be got at and tied.

In order to prevent a closure of the urethra, as well as to enable the patient to make water easily, and keep the urine from coming into contact with the wound, many surgeons, as soon as the operation is finished, introduce a short silver cannula, or an ordinary catheter, into that canal. If the short cannula be chosen, it must be made with little rings, so that it may be conveniently fastened in its situation. A silver catheter has also been employed by some practitioners, before the operation was begun, with a view of keeping the penis steady, and preventing its retraction, whereby the taking up of the arteries was supposed to be facilitated. § The introduction of any tube for the latter purpose, however, must be entirely useless, as the instrument evidently cannot hinder the corpora cavernosa from retracting. But were the amputation about to be done towards the pubes, I should certainly pass a silver catheter before the operation, because, as Richter observes, here the retraction of the parts is such, that the introduction of the instrument afterwards might be found difficult, if not impracticable, however urgent the occasion for its use might become.

With respect to the introduction of any tube, either before, or directly after the operation in ordinary cases, surgeons do not appear to be unanimous upon the subject. I have seen the operation done very well without it, and the parts favourably healed, a bougie having been passed a little way into the

* Dolignon, *Journal de Médecine*, t. lxxxiii.

† Siebold, *Chir. Tagebuch*, p. 52.

‡ Sabatier, *Médecine Opératoire*, t. ii. p. 306. Ollenroths, *Hufeland's Journal*, 5 b.

§ Ollenroths, *op. cit.*

urethra once a day, after the removal of the dressings, to hinder the contraction of the orifice of the urethra, and trouble in expelling the urine. This was Mr. Hey's practice.

Were a catheter considered right, however, perhaps a flexible gum catheter would be preferable to a metallic tube, since it would create less irritation. After amputation of the penis, the irritation which the wound suffers from the urine, and the necessity of doing something to hinder the orifice of the urethra from closing, without an instrument to conduct this fluid out, will probably always lead many practitioners to continue to introduce a cannula, or flexible gum catheter. The instrument, however, should be large, for otherwise the urine getting out between it and the urethra, and wetting the dressings, irritates and frets the wound. Le Dran mentions a case, in which the orifice of the urethra became impervious, so that the urine could not be discharged, in consequence of the neglect to introduce a cannula.* Bertrandi cites another case from the writings of Nannoni, where it became requisite to enlarge the orifice of the urethra by an incision, the surgeon not having taken the proper precautions soon enough after the operation, to hinder the opening from closing. Desault also records an example, in which it was necessary to use caustic for the same purpose. If the operator should determine not to use such an instrument, he must not attempt to save skin, as, when this is brought forward, it would obstruct the exit of the urine.

CHAPTER XXII.

STRICTURES OF THE URETHRA.

A STRICTURE of the urethra may be defined to be a preternatural diminution of the diameter of a part of that canal. By the late Mr. Hunter, strictures of the urethra were divided into three kinds; first, the true permanent stricture, arising from an alteration in the structure of the passage; secondly, a mixed case, composed of a permanent stricture and spasm; and thirdly, the true spasmodic stricture.† This mode of taking up the subject supposes the

* Operations in Surgery, p. 158. edit. 2.

† See a Treatise on the Venereal Disease, p. 111. ed. 2.

urethra to possess a natural power of contraction and relaxation, a circumstance which, though possibly true, and most commonly believed in this country, is not universally admitted; and abroad, especially in France, can be said to have very few advocates. The doctrine of Mr. Hunter, however, has been ably supported by the observations of his brother-in-law, Sir Everard Home, and the facts usually adduced in proof of the contractile power of the membrane of the urethra, I confess, have always inclined me to regard the doctrine as well founded. It may be difficult, and perhaps impossible, (says Sir Everard Home,) to prove this membrane to be muscular, either from its appearance, or from examination of its texture, since the peculiar structure, upon which the contraction of a muscle depends, has not as yet been ascertained. Other structures, apparently membranous, and equally unlike the fasciculated fibrous texture commonly met with in muscles, are endowed with a power of contracting and relaxing, in a much greater degree than is ever found to take place in the membrane of the urethra. The *tænia hydatigenia ovalis*, an animal consisting of a semitransparent membranous bag, met with in the brain, liver, and omentum of sheep, when taken from its natural situation, and kept in tepid water, contracts and relaxes the different parts of its bag to a considerable * extent. The muscular structure of the ureters cannot be demonstrated; yet, no one doubts, that they possess a contractile power. Their function of conveying the secreted urine from the kidney to the bladder, requires the exercise of tonic powers; and the idea of this fluid finding its way by the force of gravity, is not only repugnant to the laws of the animal economy, but is irreconcilable with obvious phenomena. The adhesion of the sides of the tube, where it penetrates the coats of the bladder, presents an obstacle, which can be overcome only by the exertion of some force; and this obstacle is vastly increased in the distended state of the bladder, during which the fluid is constantly finding its way into this receptacle.†

In the same manner, although the muscular structure of the urethra cannot be demonstrated, many phenomena are in favour of the affirmative, and, at all events, leave no doubt of the canal possessing a power of altering its diameter. Here the functions of the part, and certain facts remarked in practice, afford a better criterion than anatomy, which, it is allowed,

* See Practical Observations on the Treatment of Strictures, &c. by Sir E. Home, p. 15.

† Rees's Cyclopædia, art. Kidney.

does not in this instance give us any kind of evidence; or what it is said to demonstrate upon this point, by no means tends to confirm the opinion of the urethra being a muscular as well as a membranous tube. I here allude more particularly to the ingenious observations of Mr. Shaw, who has discovered, that there is in the membranous part of the urethra a vascular structure resembling the corpus spongiosum, and capable of injection. This anatomical fact, he conceives, may be taken to disprove the existence of muscular fibres in any part of the urethra, since what has been described as muscular fibres immediately under the mucous membrane, is the uninjected vascular texture of the internal spongy body*, the term applied to this newly remarked structure. Yet, there are various circumstances, which forbid us from coming to the decision, that the membrane itself of the urethra cannot be muscular. When the urine passes out, the canal is large: when the semen is thrown out, it is small. When a portion of its membrane is in an inflamed state from gonorrhœa, its surface is more readily stimulated, and the irritation of the urine makes it contract so much, that frequently the fluid is voided only by drops. In this state, if the penis be immersed in warm water, the urethra often becomes suddenly relaxed again, and the urine is more easily discharged. In many cases, the surgeon finds, when he attempts to introduce stimulating injections into the urethra, that they will not pass on towards the bladder, but bring on so strong a contraction of the passage, that they are rejected again with considerable velocity.

The celebrated Sömmerring has explained the formation of strictures by a thickening of the diseased part, and he does not appear to entertain any belief in the spasmodic nature of these cases.† The same opinion is professed by several modern French surgeons.‡ Mr. Charles Bell believes, that the white condensed substance, which constitutes the most common kind of stricture, must be equally incapable of yielding to pressure and spasmodic action. He observes, that this fact of the firm nature of a stricture, pointed out by Mr. Hunter, is a sufficient proof that a stricture cannot be spasmodic;

* See *Medico-Chirurgical Trans.* vol. x. p. 353, &c. 8vo. Lond. 1819.

† Sömmerring, *Abhandlung über die schnell und langsam tödtlichen Krankheiten der Harnblase und Harnröhre bey Männern im hohen Alter.* Frankf. 1809.

‡ Delpech, *Précis Élémentaire des Maladies réputées Chirurgicales*, t. i. p. 554—556. 8vo. Paris, 1816. Richerand, *Nosographie Chir.* t. iii. p. 487, &c. edit. 4.

and that even if the diseased part of the urethra were originally muscular and contractile, the condensation and callosity of the part must be attended with loss of such contractile power.

M. C. Bell argues, that it is from confounding the effect of the proper muscles of the urethra, the canal has been imagined to possess a muscular property. "I made (says he) the following simple experiment, in order to put this to the test. I got a small ivory ball, to which I attached a thread. I introduced the ball into the urethra. I made the man endeavour all he could to push it out, but he could not; neither was it retained in the slightest degree, when pulled by the thread. I thought it might be more satisfactory, if I imbued the ball with something stimulating. I tried coarse soap and spirits; but still there was no power in the urethra to retain the ball, or to push it forth. This could be done only by the urine behind it, and the operation of the bladder, or the ejaculator seminis. I need not add, that this experiment was made upon a part of the urethra anterior to the seat of the ejaculator seminis. In the course of practice I find, that when the silver ball is introduced down to the ejaculator seminis, it is resisted by that muscle, especially when the parts are irritable. I find it sometimes thrown out of the grasp of the muscle; but when pushed fairly into the sinus of the urethra, which is into the middle of the muscle, the ball is allowed to remain."* The same gentleman also endeavoured to ascertain, whether the urethra had any action on fluids. He employed a glass tube to throw an injection into the urethra, the end of the tube being constructed for passing into the orifice of the passage. Pressure was made on the urethra five inches down. By elevating the tube or column, the fluid distended the urethra; but no irregularity in the height of the fluid in the tube indicated any muscular power of the urethra to discharge its contents. When the urethra was distended, the slightest touch upon it with the finger elevated the fluid in the tube; but no effort of the patient produced the effect. When he made the effort, it was with the ejaculator seminis, behind the part of the urethra compressed by the fingers.† The conclusion drawn by Mr. Bell from these facts, is, that the part of the canal, anterior to the muscles which surround it, has no muscular power.

Mr. Bell thinks, that we can be at no loss to account for spasm in the posterior part of the urethra, since five inches of

* Letters concerning Diseases of the Urethra, p. 95. 8vo. Lond. 1810.

† Ibid. p. 96.

the canal in that situation are surrounded by muscles; the accelerator urinæ, or ejaculator seminis; the sphincter vesicæ, the compressor prostatæ, and the levator ani. And, he adds, that it must never be forgotten, that it is the sensibility of the urethra which governs their contraction.

The action of the muscles in the perineum, as an explanation of some of the phenomena remarked in cases of stricture, has been too much overlooked, and there can be no doubt that they in some degree have the effect, which the foregoing writer imputes to them; but, possibly, the membrane of the urethra may yet be itself endued with a muscular, or at all events a contractile power. Notwithstanding the impossibility of an anatomical demonstration of muscular fibres around this passage, and the effects which the action of the muscles in the perineum have upon the urethra, and certain strictures of it, I confess, that my own mind still inclines to the sentiment espoused by Haller, Hunter, and Sir E. Home, that the membrane of the urethra is itself contractile. Without this belief, it appears to me impossible, satisfactorily to account for particular phenomena, which are remarked in the functions of the urinary organs, and in the practice of surgery. Certainly every thing cannot be explained by the contraction of the larger muscles, with which the urethra is embraced. Thus, for instance, a bougie may frequently be easily introduced as far as a stricture; the patient suffers little uneasiness, and no resistance is experienced; but no sooner is the passage irritated by the pressure of the bougie against the obstruction, than it contracts, and grasps the instrument with manifest force. Much resistance is now felt on withdrawing the bougie, and it is in a great measure continued till the instrument is quite out of the urethra. There are few surgeons of any experience who have not observed this fact. Did the resistance depend upon a spasm of the muscles in the perineum, it could only last while the bougie was in the contiguous part of the urethra. We find, however, that even the last inch of the bougie is evidently grasped. The experiments of Haller are also at variance with the conclusions above related; for he distinctly mentions, that chemical stimulants will make the urethra contract. Indeed, as a late writer observes, the muscular power of this canal may be proved, almost in any instance, by introducing a bougie of moderate size into the healthy urethra, and lightly supporting the end that projects from the penis in a horizontal position. If the action of the urethra be then watched with attention, it will be found, that the power which expels the instrument, in other words the contraction of the urethra, is uniform through its

whole extent. The point of the bougie is not pushed forward more quickly while it moves through the bulb of the urethra, where the canal is surrounded with strong muscles, than it is afterwards; but, on the contrary, its motion is exceedingly slow, and perfectly equal throughout, until the whole of the instrument is expelled, and the point fairly drops from the orifice of the urethra. * These considerations are also favoured by analogy, since comparative anatomy demonstrably proves, that, in the larger animals, particularly the horse, where structure is more easy of investigation, and the functions of the urethra precisely the same as in man, the strong muscular fibres encircling the urethra cannot be overlooked. †

Mr. Shaw, who adopts similar views of this question to those entertained by Mr. C. Bell, reinforces the arguments of the latter, not only by additional reflections, deduced from a consideration of the action of the muscles in the perineum, as an explanation of some circumstances usually imputed to spasm of the urethra itself, but by referring a great deal to the natural elasticity of its membrane ‡, and adducing a mode of reasoning commonly employed by the French § and German surgeons, in their account of the formation of strictures. Thus, when a circumstance in this disease cannot be explained by the action of the ejaculator seminis and other muscles in the perineum, it is ascribed either to elasticity of the passage, or to a transient increased determination of blood into the corpus spongiosum, producing a temporary augmented diminution in the calibre of the urethra, and a fallacious appearance of spasm in that canal. ||

* Howship's Practical Observations on Diseases of the Urinary Organs, p. 180.

† *Ib.* p. 182. According to Mr. Shaw, this appearance in the horse proceeds from the ejaculator seminis being continued up to the glans. See *Medico-Chir. Trans.* vol. x. p. 342.

‡ "The injection was expelled by the elasticity of the parts." *Medico-Chir. Trans.* vol. x. p. 346. The final expulsion of a bougie is referred to the same cause. *Ib.*

§ "N'a-t-on pas pris les commencemens de la coarctation aggravée par les augmentations passagères de l'engorgement des parois du canal, pour le spasme dont il s'agit." Delpéch, *Précis Élémentaire des Maladies réputées Chirurgicales*, t. i. p. 556. 8vo. Paris, 1816.

|| Upon this principle, viz. the diminution of the canal by the swollen state of the parts, combined with irregular action of the muscles in the perineum, and of the detrusor urinæ, Mr. Shaw accounts for the stream of urine becoming smaller in gonorrhœa, or being quite stopped, and for the impossibility of throwing a stimulating injection into the bladder. *Ib.* p. 347.

A further prosecution of this inquiry would lead me at present far beyond the limits to which I am confined, and therefore I shall merely express my opinion, that, however curious and interesting the question may be in an anatomical or physiological light, it is less important in a surgical point of view than might at first be imagined, since the treatment of strictures should in all probability be conducted on precisely the same principles, whether the spasm, that sometimes has a share in increasing the impediment to the exit of the urine, depend upon the muscularity of the membrane of the urethra itself, or upon the muscles situated near this canal. This I should conceive must be the case, especially as the action of the muscles in the perineum is said by Mr. Bell himself to be entirely governed by the sensibility of the passage. I think, however, that the term spasmodic stricture might as well be dropped, and that no case ought to be called a stricture, until there is some permanent contraction, arising from a chronic thickening, or a change of structure, in the diseased part of the urethra. I confess also, it has never been clear to me, that any material light is thrown upon the mode in which the disease is formed, by imputing so much to spasm as several writers have done; and whether the membrane of the urethra be contractile or not, a permanent stricture could never be formed without some process by which the part is thickened as well as constricted. According to Mr. Hunter, the disease generally occupies no great length of the passage; and in most of the cases which he had seen, it extended no further than if the part had been surrounded with a piece of packthread. Indeed, in many of the examples, the stricture is said to have presented a great deal of that appearance. Mr. Hunter adds, however, that he had seen the urethra contracted for more than an inch in length, owing to its coats, or internal membrane, being irregularly thickened, and forming a winding canal.* And Mr. Samuel Sharp, in speaking of strictures, informs us, that they happen sometimes to a small portion of the passage only; at other times, *to a very considerable length of it*; and, frequently, to three or four different parts of it.† Sometimes also, as Sir E. Home observes, two strictures form within an inch of each other, and the space between them becomes narrower than the rest of the canal.

A stricture, says Mr. Hunter, does not arise, in all cases,

* Treatise on the Venereal Disease, p. 115.

† See Critical Inquiry into the present State of Surgery, p. 145. ed. 4.

from an equal contraction of the whole circumference of the urethra; but, in some, from a contraction of one side. And Sir E. Home informs us, that he has met with cases where there were three strictures, and all on the same side of the urethra, the other being perfectly smooth. This form of the disease throws the passage to the opposite side, and often renders the introduction of the bougie difficult. Mr. Hunter also acquaints us, that the contracted part is whiter and harder, than any other part of the urethra. Sometimes there are more strictures than one, and this eminent surgeon had seen half a dozen in one urethra, some of which were more contracted, than others. Indeed, says he, many urethras, that have a stricture, have small tightnesses in other parts of them.

DIAMETER OF DIFFERENT PARTS OF THE URETHRA.

The urethra naturally is not of the same diameter throughout its whole extent; and some parts of it are found to be much more liable to stricture than others. In order to determine with precision the length as well as width of the urethra, Sir E. Home took exact casts of it in wax. The subjects from which they were taken were of different ages; one was between 70 and 80; the other 30. The length of the canal corresponded exactly in both casts. From the external orifice to the neck of the bladder was 9 inches; but, in a note, this gentleman observes, that, in a relaxed state, the canal is commonly about $8\frac{1}{2}$ inches in length. From the external orifice to the bulb of the urethra was 7 inches. The membranous part, extending from the bulb to the prostate gland, $1\frac{1}{2}$ inch; and the canal passing over the prostate gland was half an inch in length.

The following were the diameters of the casts of the urethra in different parts:

	Years old	80	30
At $\frac{3}{4}$ of an inch from the external orifice	-	-	$\frac{9}{10}$ $\frac{7}{10}$ $\frac{1}{2}$
At $4\frac{1}{2}$ inches from the external orifice	-	-	$\frac{7}{10}$ $\frac{7}{10}$
At the bulb, seven inches from the orifice	-	-	$\frac{11}{10}$ $\frac{11}{10}$
In the membranous part directly beyond the bulb, $7\frac{1}{4}$ inches from the orifice	-	-	$\frac{7}{10}$ $\frac{4}{10}$
In the membranous portion near to the prostate gland, $8\frac{1}{2}$ inches from the orifice	-	-	$\frac{9}{10}$ $\frac{7}{10}$
Where the membranous part terminates, and the prostate gland begins, $8\frac{1}{2}$ inches from the orifice	-	-	$\frac{11}{10}$ $\frac{11}{10}$
At the neck of the bladder, 9 inches from the orifice	-	-	$\frac{9}{10}$ $\frac{9}{10}$

These dimensions, it is to be understood, are much beyond those of the easy state of the urethra.

MOST FREQUENT SITUATION OF STRICTURES.

The two parts of the urethra, which are naturally the most narrow, are found also to be those most liable to stricture. In fact, strictures occur most commonly just behind the bulb of the urethra, the distance from the external orifice being $6\frac{1}{2}$ or 7 inches. The situation, next in order of frequency, is about $4\frac{1}{2}$ inches from the orifice of the glans. Strictures do also form at $3\frac{1}{2}$ inches from this orifice, and sometimes almost close to it. Mr. Hunter never met with a stricture in that part of the urethra which passes through the prostate gland, (p. 114.) In some cases, as Sir E. Home further remarks, the external orifice itself is contracted. When this happens, it is sometimes the source of considerable errors, the surgeon supposing the whole canal to be naturally formed of the same size.

The prepuce also is very often contracted, which is called a natural phimosis. Sir E. Home believes, that this more frequently happens in those who are disposed to strictures, than other men.

In almost all the cases, which have come under this gentleman's care, there was one stricture about seven inches from the external orifice, whether there were others, or not. Such part of the canal seems much more disposed to contract, than the rest of it.

SYMPTOMS OF STRICTURE.

It is noticed by Mr. Hunter, that most of the obstructions to the passage of the urine, if not all, are attended with nearly the same symptoms, so that there are hardly sufficient marks for distinguishing the different causes. Few patients take notice of the first symptoms of a stricture, till they have either become violent, or have been the cause of other inconveniences. For instance, a patient shall have a considerable stricture, without observing, that he does not make water freely; he shall even have a tendency to inflammation and suppuration in the perineum, and not feel any obstruction to the passage of his urine, nor suspect that he has any other complaint than the inflammation in the perineum. In all these obstructions the stream of water becomes small, and that in proportion to the obstruction; but this symptom, though probably it is the first, is not always noticed by the

patient. In some instances, the urine is voided only by drops, and then the disorder cannot escape notice; in others, the stream is forked, or scattered.* Although, as Sir E. Home observes, the first progress of the contraction is in general very slow, yet, when once it has so far increased, that the urethra is not wholly relaxed by the force of the urine, its subsequent advances are more rapid, and new symptoms are perceived. The urine is voided more frequently; does not pass without a considerable effort, attended with pain, and a straining continues after the bladder is emptied. If the patient accidentally catches cold, drinks a glass of spirituous liquor, acid beverage, or punch, commits an excess in drinking wine, or removes quickly from a warm to a cold climate, the urine will pass only by drops, or be entirely obstructed; these causes inducing in the contracted part, or adjacent muscles, a spasmodic action, by which it is closed. Cold, externally applied to the body, (continues Sir E. Home,) has so great an effect upon a spasmodic stricture, or, as others would say, a stricture liable to be increased by spasms of the muscles in the perineum, that a patient, who can make water without the smallest difficulty in a warm room, upon attempting it in the open air, shall be entirely unable to void a drop; but, even in this difficulty, if he returns to a warm room, and sits down some little time, the urine will come away. The experience of the same gentleman tends to prove, that the symptoms of stricture come on more frequently when the patient is leading a sedentary, than an active life.

From the long continuance of strictures, the bladder becomes contracted. This is sometimes, as a late writer observes, merely a temporary affection; but, in other instances, it depends upon a changed organization of the bladder, and is then generally a disease for life. Upon inspecting such a contracted bladder, the muscular bands are found enlarged, and its whole substance surprisingly thickened. In these cases, the urethra behind the stricture, and the ureters, instead of being contracted, like the bladder, are often greatly expanded.†

Permanent strictures are generally attended with a discharge of matter, or a gleet. This is often considered by the patient as the whole disease; and sometimes it is not till after the surgeon has long tried in vain every means, that he can

* Hunter on the Venereal Disease, p. 112.

† See a Treatise on Stricture of the Urethra, by James Arnott, p. 39, 8vo. Lond. 1819.

imagine, to effect a cure, that other symptoms are noticed, and a stricture is at last suspected. In diseases of the urethra, and also in those of the prostate gland and bladder, there is usually an uneasiness about the perineum, anus, and lower part of the abdomen; and, as Mr. Hunter remarks, the patient can hardly cross his legs without pain.

Frequent intercourse with women generally renders strictures worse. Under these circumstances, says Sir E. Home, the membrane of the urethra is kept longer in a state of contraction; and the part disposed to stricture loses the power of relaxing itself again. Although the passage is not completely closed, it is rendered much narrower, and remains in an extremely tender state. Hence, the passage of the urine irritates it, and in a few hours, a discharge of matter comes on similar to that from gonorrhœa. In certain instances, the contraction is so great, that it stops the emission of the semen altogether, and forces it back into the bladder; while, in some other cases, this fluid passes through the stricture after the orgasm has taken place, but with little or no force.

There is one circumstance, which has a great tendency to make a stricture be mistaken for a gonorrhœa; viz. the pain in making water is confined to the same spot in both diseases. A stricture in the membranous part of the urethra does not render the part itself particularly sensible; but all the painful sensations are felt about an inch and a half from the orifice of the glans penis. This is a general fact, and unaccountable as it may seem, it is not more extraordinary, than the burning pain felt in the glans, in cases of stone, even when the whole of the urethra is perfectly sound.

When a stricture is in an advanced stage, the diseased part is at all times much narrower than the rest of the canal. According to Sir E. Home, however, the stricture still retains a power of contracting and relaxing itself: in the contracted state, closing up the passage; in the relaxed state, allowing the urine to pass through it in a small stream. In this state, the stream is so small, and the exertion necessary to empty the bladder so great, that the patient can seldom be wholly ignorant of his complaint.

The spasmodic contraction, upon any irritation being applied to the part, is represented as very great. This is known by the urine being unable to pass in a stream; and by the extreme difficulty of now passing a small bougie, which, in the relaxed state of the canal, met with no resistance. The bougie also, if allowed to remain a few minutes, is not unfrequently grasped so tight by the spasmodic contraction, that it cannot be withdrawn without considerable force. The bougie,

when examined, (continues Sir E. Home,) puts on an appearance, exactly resembling what would have been produced, if a piece of packthread had been tied round it. In this stage, the spasmodic contractions, although more violent, occur less frequently, than while the stricture was in a more recent state. When the stricture has been of some years standing, the coats of the bladder become thickened, in order to increase the power of this organ to expel the urine, the evacuation of which is rendered difficult by the obstruction. The bladder, in this thickened state, does not admit of the usual dilatation, so that the patient is obliged to make water every three or four hours, or oftener.*

In addition to the foregoing symptoms, I have further to enumerate amongst the numerous effects of strictures in the urethra, nocturnal emissions; and, in irritable patients, a variety of unusual sensations about the membranous part of the urethra, conveying to the mind the idea of something crawling, or fluttering. In many cases, also, there is a periodical discharge, brought on by cold, or other occasional causes. When this happens, the inflammation extends to the bladder; the frequency of making water is very much increased; and the urine very turbid. Sometimes the bladder inflames more violently, and secretes purulent matter, which passes out after the urine. In still worse attacks, the discharge from this viscus is glairy, like the white of egg, and of a strongly tenacious consistence. The discharge of pus and gelatinous mucus with the urine, has been regarded as particularly evincing an ulcer, or calculus in the bladder; but it is a symptom which arises from any irritation of that organ, and is frequent in cases of old strictures.

Attacks of the preceding kind may bring on peritonitis, and the patient be carried off. Sometimes also the incessant irritation of the strictured part, by the efforts to make water, brings on a gradual diminution of the canal, and, in a few instances, a total obliteration of a portion of it. This last event cannot happen without destroying the patient, unless another outlet be formed for the urine. Complete strictures, therefore, as Sir E. Home remarks, are only met with where fistulæ in perinæo have been produced.

Some patients with strictures seem extremely liable to complete paroxysms of fever; that is to say, they often have a cold, hot, and sweating stage of febrile disorder, in regular

* See Home's Practical Observations on Strictures.

succession. The sweating is also remarked to be much more profuse than in a common ague.

Strictures in the urethra likewise occasion a swelling of the testicle; and their irritation not unfrequently brings on hemorrhoids. When permanent and considerable, they are also apt, under particular circumstances, to cause strangury and retention of urine. If a patient goes suddenly from a warm into a cold situation; if he drinks too freely of wine; eats high-seasoned dishes; catches cold; commits any species of intemperance, or delays making water too long, after feeling the inclination, he exposes himself to the danger of these latter grievances.

In particular cases, where the obstruction to the passage of the urine has been considerable, and the efforts to expel it protracted and frequent, the part of the urethra between the stricture and the bladder becomes expanded beyond its natural dimensions.

The affections, which are most liable to be mistaken for stricture, are spasm of the muscles surrounding the urethra; common inflammation of the passage; gonorrhœa; tumour, inflammation, or abscess in the neighbouring parts pressing upon the urethra; swelling of the lacunæ of the urethra; stone in this canal, or the bladder; and diseased prostate. According to a modern author, in cases of stricture, the increase of the gleet discharge and pain, after coition, comes on suddenly after the cause, and, if left to itself, will generally decline in about a week. On the other hand, in gonorrhœa, a few days usually intervene between the exposure to infection, and the beginning of the symptoms, which then gradually increase to their acmé; and only begin to subside as late as ten days after their commencement. In gonorrhœa also the pain in making water is more severe.*

Obstructions from calculi in the urethra may be known by the preceding symptoms of gravel; by the collision of a sound against them; by the sudden sharp pricking pain which they excite; and often by their being obvious to the touch.

In cases of stone, the difference from stricture is proved by the stream of urine being generally full, and sometimes suddenly stopped; by the patient being able to make water more easily in some positions of the body, than in others; by there being no obstruction to the passage of instruments into the bladder; and by the possibility of touching the stone with a sound. Diseased prostate gland is to be suspected, especially

* Arnott on Strictures, p. 49.

in elderly persons, when a bougie will pass seven inches and a half without obstruction, but not into the bladder. The reason of this circumstance depends upon the fact of strictures being rarely more backward, than the beginning of the membranous part of the urethra. The swelling of the gland may also be felt within the rectum, and an elastic catheter can generally be got over the projection into the bladder. *

CAUSES OF STRICTURES.

The causes of strictures in the urethra are not known with any degree of certainty. The origin of the disease is often imputed to the effects of gonorrhœa, or to the method of curing it. Mr. Hunter conceives, however, that there are many reasons, why this doctrine is not likely to be correct. Strictures, he observes, are common to most passages in the human body; they often occur in the œsophagus; in the intestines, especially the rectum; in the anus; in the prepuce, producing phimosis; and in the lachrymal duct; without any previous disease. They sometimes happen in the urethra itself, without ever having been preceded by any venereal complaint. Mr. Hunter saw an instance of this kind in a young man of nineteen, who had had a stricture for eight years, and which therefore must have begun when he was only eleven years of age. The case was treated at first as the stone, or gravel. The patient was of a weak, scrofulous habit, and the stricture in the most usual place, about the membranous part of the urethra. Mr. Hunter had also seen a stricture in a boy only four years of age, and a fistula in perinæo in consequence of it. He reminds us, also, that strictures are as common in persons who have had gonorrhœa slightly, as in those who have had it violently. They are also never found to come on during the inflammation which attends a clap, nor for some time after the infection is gone. Thirty and forty years sometimes elapse, between the cure of a gonorrhœa, and the beginning of a stricture, the health being all that time perfectly good. If strictures arose in consequence of the inflammation accompanying this disorder, we should expect to find them of some extent, because the inflammation is itself of some extent; and we should also expect to find them most frequent in that part of the urethra which is usually the seat of gonorrhœa. But, the fact is, they are not so frequent there, as they are in other parts of the urethra. Sir E. Home differs, however,

* Arnott on Strictures, p. 52, 53.

from Mr. Hunter on this point in thinking, with most other surgeons, that gonorrhœa is a very general cause of strictures.

It is supposed by many, says Mr. Hunter, that strictures arise from the use of injections in the cure of gonorrhœa; but he thought the opinion founded on prejudice; for, he had seen as many strictures after gonorrhœas, which had been cured without injections, as after other cases, which had been cured with them. Such modes of accounting for strictures, he observes, give no explanation of cases which have not been preceded by gonorrhœa, or the use of injections. Sir E. Home also thinks differently from Mr. Hunter respecting injections, the injudicious use of which he conceives may often causè strictures. Strictures have sometimes been supposed to arise from the healing of ulcers in the urethra; but, Mr. Hunter says, he never saw a sore in this passage, except in consequence of a stricture, and he therefore does not subscribe to the opinion.

The stone is sometimes a cause of stricture, and this occasionally happens in infancy. Sir E. Home has met with cases of this kind in children only six years of age, and from other examples, which he has recorded, it would appear, that the disease is frequent in calculous patients of more advanced years.

In the East Indies, and other warm climates, strictures are much more readily brought on, than in Europe; and it is thought, that the excesses in which the inhabitants of hot countries indulge, have great effect in promoting the formation of the disorder.

Strictures have been known to arise from the application of external violence to the perineum; from the irritation of blisters affecting the membrane of the urethra; and from the irritation of a diseased prostate gland. Cases, in proof of these observations, may be perused in Sir E. Home's publication.

In the year 1798, Richerand saw a dragoon in La Charité at Paris, in whom a stricture had been occasioned by a violent twist of the penis. The man had attempted to force a robust young woman, who, in repulsing him, had seized hold of his penis, and twisted it round with all her power. Considerable pain was afterwards felt at the place where the most injury had been inflicted, which was at the union of the scrotum with the penis; some drops of blood were discharged; the urethra there swelled, and even presented externally a knob: a complete retention of urine at first taking place: but, in the

end, the natural diameter of the urethra was restored by per-severance in the use of elastic catheters. *

TREATMENT OF STRICTURES.

The first object is to ascertain the precise situation of the stricture nearest the orifice of the urethra. For this purpose, a common bougie, proportioned to the size of the aperture of this canal, is to be gently introduced. If the bougie easily enters the passage, the surgeon may be well assured, that the size of the instrument is not too large, and that no impediment to its further introduction, can proceed from this circumstance; for, the mouth of the urethra is naturally one of its most narrow parts. Small bougies, and such as are too much pointed, are very apt to be stopped by the lacunæ, or orifices of the mucous glands, and to lead inexperienced surgeons into error.

In introducing any instrument properly into the urethra, some degree of skill is displayed. The surgeon should take hold of the penis, by placing the fore-finger and thumb of his left hand on each side of the prepuce, opposite the corona glandis; thus he avoids making any pressure on the passage, into which he is about to pass the instrument. This being oiled, is to be introduced a little way at first; then the surgeon is to draw the penis forward, as it were, over the bougie, with the index and thumb of his left hand, while at the same time, he gently and steadily persists in pushing the instrument further into the passage with his right hand. A bougie is to be held like a writing pen, and, as it enters the urethra, it ought to be artfully rotated first in one direction, and then in the other, in order that its extremity may more certainly escape being entangled in any natural fold of the membrane lining the passage. Having ascertained, by the introduction of a bougie, the existence and situation of the stricture nearest the mouth of the urethra, the next desideratum is to learn, whether the contraction is such as would be produced by tying a piece of packthread round the canal; whether, on the other hand, it occupies a considerable extent of the passage; and lastly, what is the size of the bougie which can be introduced through it.

A knowledge of the extent of the stricture, if it could be obtained, is a circumstance that would always be of essential use in the management of the case; because, I presume, no

* Richerand, *Nosographie Chirurgicale*, t. iii. p. 488. ed. 4.

surgeon, knowing that the obstruction and disease extend far along the urethra, would ever in such a case give a preference to the employment of armed bougies. Those armed with the nitrate of silver, could never be expected to burn their way through a stricture an inch in length; and if other bougies, armed with the caustic potassa, are conceived to admit of being applied to such a stricture with any degree of precision, or any other real efficacy, than what actually arises from the mechanical action of these instruments themselves, when passed through the stricture, I confess, that it is more than my own observations authorize me to believe. I have no hesitation in giving it as my opinion, that, in all cases of this description, as well as in others, in which two strictures are near together, and the intervening part of the canal much contracted, caustic bougies ought not to be used.

The fear of a return of a stricture, when thus completely cured, has often seemed to me a supposititious and unfounded argument, and I have frequently suspected, that one great cause of a relapse, is, that surgeons do not continue to increase the size of the common bougie in the necessary degree. On the other hand, armed bougies have always been recommended to be of a full size, and, in this manner, some part of their permanent efficacy may be explained. Notwithstanding these sentiments, caustic bougies may answer very well in the majority of ordinary cases; because, in these, the stricture is not more extensive, than if it were caused by a piece of packthread tied round the urethra, and, therefore, it can be advantageously and expeditiously cured by the application of caustic.

On account of the above reasons, and a conviction, that strictures, occupying some extent of the passage, are far more common than has been supposed, I think every surgeon should endeavour to learn, (before determining which sort of bougie he will use,) whether the stricture is such a contraction as would originate from tying a piece of packthread round the canal; or whether it consists of a more extensive diminution of the passage.

Having ascertained, that a common-sized bougie will not pass beyond a particular point of the urethra, we ought to make an impression on the instrument with the nail, closely to the mouth of the urethra. Then the bougie should be withdrawn, and the surgeon should take one of a smaller size, which he is to mark with his nail, exactly at the place corresponding to that of the impression on the first bougie. This smaller one is to be introduced so far as to bring its marked part exactly to the orifice of the urethra, at which period the surgeon knows, that the extremity of the bougie has just ar-

rived at the contraction, which would not allow the first common-sized bougie to pass. If the second bougie cannot be introduced further than the first, a still smaller one is to be tried; but the surgeon should not have recourse to the smallest bougies at once, as the largest bougie, which can be insinuated through the stricture, ought to be the model of the soft white one, which should now be introduced for the purpose of shewing the shape and extent of the stricture, by the impressions made upon it. If, after the soft bougie has remained a minute or two in the stricture, it should be marked with a distinct circular, or semicircular narrow furrow on being withdrawn, we have reason to believe, that the stricture does not occupy much of the extent of the urethra. However, whether there is any gradual conical diminution of the passage, in front of the most contracted part of the stricture, may be known by considering, whether the situation of the furrow, on the soft bougie, is exactly at the same distance from the mark made on it by the surgeon's nail, at the mouth of the urethra, as that other dent made by the surgeon's nail on the common-sized bougie, is from the end of this latter instrument. If the distance between the impression of the stricture and the dent of the nail upon the soft bougie, is greater than the space between the end of the common-sized one, and the mark of the nail, we may conclude, that there is a diminution in the diameter of the urethra, in front of the most contracted part of the stricture, which causes the distinct impression. For this kind of case, I should certainly not recommend the caustic.

In order to take an impression from the surface of a stricture on the extremity of a hard bougie, considerable pressure must be used, and this, in many cases, gives excessive pain. Hence, the soft white bougies are commonly preferred for this purpose; but, in using these, as Mr. Arnott remarks, the impression is often injured during their extraction. To avoid this source of error, he has sometimes protected such bougies by passing them through a cannula.*

We must acknowledge, that it is somewhat difficult to ascertain, by means of bougies, whether the urethra is diminished in diameter, immediately behind the most contracted part of the stricture. For this reason, and because it seems obvious, that the method of treatment ought to be different in cases of strictures, confined to a point of the urethra, and in others

* Arnott's Treatise on Stricture of the Urethra, &c. p. 77. 8vo. Lond. 1819.

occupying some extent of the passage, I think every invention for facilitating the discrimination of the two kinds of cases, ought to receive the fairest consideration and trial. Actuated by this sentiment, I feel much pleasure in noticing Mr. Charles Bell's proposal, to use a particular sort of probe for ascertaining the extent of strictures. "I procured (says this gentleman) a series of silver and gold probes *, with circular knobs; the knobs varying from the full size of the urethra to what will just pass the narrowest stricture. By successively introducing smaller balls, I ascertain the degree of stricture by the ball which passes easily, and I am secure of being in the passage, by passing the probe onward, when it has got beyond the stricture. Then by the slight feeling of resistance in passing the ball, and in withdrawing it again through the obstruction, I ascertain the extent of the contraction. If the ball of this probe be liable, like the point of the bougie, to enter one of the lacunæ, or on passing it to rub upon its edge, yet by feeling whether the same roughness or difficulty attends the withdrawing of the bulb of the probe, as when it passed downward, we may be assured, whether there be a stricture of the canal, or whether the obstruction be not caused merely by the lacuna." † The author proceeds to observe, that, as the lacuna opens towards the urethra, its edge cannot catch the probe, while this instrument is being withdrawn, at which period a uniform smoothness must be felt, unless there be disease. When there is an irregular hardening of the urethra for a considerable extent, the probe moves along it with difficulty; but, no sooner has it passed the obstruction, than it moves on with freedom. ‡

Likely as these ball-probes for the urethra at first seem to be to afford desirable information respecting the species of stricture, they are at present not much used by surgical practitioners. In fact, in practice, they do not answer; and it is the contractile power of the urethra, or (if others will not allow it) it is the action of the muscles contiguous to this passage, which sometimes stops the easy introduction of the probe even when there is no permanent stricture whatever, and which makes it more difficult to ascertain the nature and extent of the obstruction, than would otherwise be the case. In a subsequent part of this chapter, the reader will find an account of another contrivance for ascertaining the extent and

* Plate xvi. figs. 1 and 2.

† System of Operative Surgery, vol. i. p. 104.

‡ Plate xvi. figs. 1 and 2.

relative situations of strictures: it is a modification of Arnott's dilator; but, I can offer no opinion at present respecting the degree of utility which is really derived from this last means in practice, as I have not yet seen it tried.

That great utility in practice would be derived from being able to learn the nature of the stricture, must be as obvious as the fact, that a caustic bougie is not at all calculated to remove the obstruction, when it is of much extent. Such an instrument (I mean particularly one armed with lunar caustic) could only act on the anterior part of the contraction, without presenting any prospect of being sufficiently efficacious to burn its way, by repeated applications, through the whole extent of the stricture. Even could we imagine that it had this power, our judgment and common sense would revolt at the doctrine of this being the proper method to be pursued. On the other hand, the common and some other kinds of bougies, are introduced through the whole extent of the stricture, and acting like a wedge on every part of it, produce a general dilatation of the obstruction. When the stricture is attended with a conical lessening of the canal in front of it, a common bougie must also merit the preference.

METHOD OF USING THE COMMON BOUGIE.

This instrument acts by producing a mechanical dilatation of the stricture. However, as it operates on living matter, it either makes the dilated part adapt itself to its new position, or recede by ulceration. If the case is one, that will allow even the smallest bougie to be introduced through the stricture, the cure may be considered as in our power. In many cases, in which the stricture is considerable, a great deal of trouble is given by occasional spasms, which either prevent the introduction of the bougies altogether, or only allow a very small one to pass. In such cases, Mr. Hunter was sometimes able to make the bougie pass, by rubbing the perineum with one hand, while he pushed forward the bougie with the other. He was also in the habit of frequently succeeding, by letting the bougie remain close to the stricture a little while, and then pushing it forward. The spasm (whether of the muscles in the perineum, or of the membrane of the urethra itself, is a matter of no great practical importance) has sometimes been removed by dipping the penis in cold water.

It is justly remarked by Mr. Arnott, that the introduction of instruments through a very narrow stricture, is a nice and difficult part of the treatment. A common bougie, small enough to pass through the stricture, has not sufficient

strength to retain its form while passing down the urethra; and, in such a case, much danger of piercing the canal attends the use of a sharp-pointed metallic instrument; while cat-gut, which has been commonly employed, on account of its having greater strength, with less bulk, than any other substance, is liable, if retained, to swell and become difficult of extraction. Hence, the preceding author has for some time past made use of the following expedient. He passes a full-sized cannula down to the stricture, ascertains the situation of the opening in it, and then introduces through the tube the smallest common bougie. This being unimpeded by the contact of the urethra, he searches for the opening with great advantage; and, if the first bougie fail, others may be successively used, without exciting new irritation. This method, says Mr. Arnott, possesses some of the advantages of the plan, in which the catheter at the period of its introduction serves also the purpose of distending the urethra with water.*

It is sometimes difficult to ascertain, whether a small bougie has passed through a stricture, or has only bent. In this case, a common-sized bougie should be previously introduced to learn the situation of the stricture, and afterwards, when the end of the small bougie is known to have reached the obstruction, the surgeon should push the instrument forward very greatly, and for a short time. If the bougie enters the penis further, he may know whether it has entered the stricture, by removing the pressure from the bougie; for if this recoil, it has not passed, but only bent.

However, a very small bougie might be bent, and yet not recoil.

After the bougie has passed a little way through the stricture, and remained there a short time, we should withdraw it, and examine its extremity. If this should be flattened, grooved, or have its waxen coat pushed up for some extent, or if there should be a circular impression on the bougie, or only a dent on one side, made by the stricture, we may be sure that it has passed, as far as those appearances and impressions extend.†

Now it becomes necessary to introduce another exactly of the same size, and let it remain as long as the patient experiences no particular inconvenience. It is a rule in using the bougie, to avoid as much as possible subjecting the patient to great pain, either from the length of time during which the

* Arnott, *Treatise on Strictures in the Urethra*, p. 81.

† *Treatise on the Venereal Disease*, by J. Hunter, p. 117—120. edit. 2.

instrument is kept in the canal, or by the size of the bougie being too suddenly increased.

When the end of the first bougie is blunted, we may be sure, that it has not passed the stricture at all.

The best time for wearing bougies, is when the patient is in bed in the morning, or when he is not obliged to move about. Where the cure is attempted by repeated introductions of the bougie, the intervals may be from half a day to three days, according to the degree of irritation * produced. The bougie should be gradually increased in size, in proportion as the stricture dilates, till the largest one can easily pass, and its use should be continued for three or four weeks afterwards, in order to habituate the parts to their new state.

It is well known, that strictures are very liable to return, and hence, the treatment with common bougies has been accused of inefficacy. I have known some cases, however, in which the cure lasted many years, and others, in which the stricture returned, although caustic bougies had been employed. One reason, why the disease often relapsed in former times, was, because surgeons had no correct notions respecting the naturally capacious diameter of the urethra, and, consequently, they never increased the size of the bougie, as far as it ought to have been, in proportion as the disease gave way. On the other hand, in the practice with caustic bougies, surgeons have always given the preference to those of large size; and, if these instruments ever render the cure more durable than common bougies, or flexible catheters, I conceive, that the success is in a great measure ascribable to this circumstance.

One advantage, which common bougies have over those furnished with caustic, consists in their being calculated, when introduced into the bladder, to operate on several strictures at once.

The first introduction of a bougie sometimes produces extreme pain, fainting, shivering, &c.; but, in general, the second and every succeeding repetition of the operation can be borne better, and, at length, the inconvenience is but trivial. Sometimes, however, the irritation of the bougie is such as to compel the surgeon to discontinue its use for a time, and have recourse to antiphlogistic and anodyne remedies.

The slipping of a bougie into the bladder is a serious accident, which may be prevented by tying round its outer end

* Arnott on Strictures, p. 85.

a piece of thread, which is to be carried over the dorsum of the penis, and there gently secured.

TREATMENT OF STRICTURES WITH ELASTIC GUM CATHETERS AND BOUGIES.

Perhaps there is no plan of treating strictures in the urethra, which is so mild and unirritating as that with instruments coated with elastic gum. It is the common method of treatment followed in France, where caustic bougies appear to be entirely abandoned. The celebrated Desault, who had considerable success in the treatment of strictures, rarely employed any means of cure, except an elastic gum catheter. That this instrument can frequently be introduced through a stricture, even when nothing else will pass, seems well known to every practitioner in surgery; for, whether he is an advocate for one method of cure, or another, he no sooner fails in his attempts to get through a stricture, than he tries what can be done with a gum catheter. It is quite unnecessary to dwell long on the mode of curing strictures with this instrument, or the elastic gum bougie. The cure is effected on the principle of dilatation; the very same principle, on which the common bougie operates. The catheter will sometimes pass without the stilet, when it will not do so with it. This instrument being much less irritating than a common bougie, can be longer worn without inconvenience, especially as the patient can also void his urine without taking it out. Indeed, it may be worn several days together, if judged advisable; but, I believe, it is generally better to withdraw it sooner, and endeavour to get in as quickly as possible other elastic gum catheters of larger size.

According to a modern writer, the following simple plan will sometimes enable a surgeon to get a catheter down to a stricture, when other ways fail: it is to distend the urethra during the operation with a liquid injected through the catheter from a bag attached to its outer extremity. The penis must be gently grasped at the time, so as to prevent the return of the liquid by the sides of the instrument. The stricture, and action of the bladder, will now oppose the flow of the injection into the latter viscus, and the whole urethra be distended with moderate force, while the catheter may still be freely advanced, or withdrawn. This distention of the canal (says Mr. Arnott) removes every obstacle to the passing of the catheter, until it reaches the stricture itself, (an object of considerable importance, where it is necessary to pass an instrument into an irritable urethra); and the orifice of the stricture

being also filled and distended by the unirritating fluid, is open for the reception of the instrument's point. Thus, the urethra in front of the stricture becomes a distended bag, and the extremity of the catheter, moving about in the free space, may touch every point of its surface, until it enters the narrow continuation of the canal.* The foregoing artifice appears to be chiefly intended, however, as an auxiliary in the passage of a silver catheter, though, in difficult cases, it might also be tried in conjunction with an elastic instrument of this kind.

The elastic gum bougie sometimes will not pass a stricture situated about the bulb of the urethra, owing to the elasticity of the instrument tending to keep its point from ascending over a ridge on the lower side of the canal. On this account, I have found them in some cases not to answer, and have been obliged to use either a common bougie, or an elastic catheter containing a wire.

METHOD OF USING BOUGIES ARMED WITH THE NITRATE OF SILVER.

The idea of applying caustic to strictures, through a cannula, was known to Wiseman. It appears, that Mr. Hunter, without having been aware, that the method had been noticed by the above writer, adopted the same plan in his own practice. The instruments which he employed for applying the caustic, consisted of a silver cannula, and a stilet. One end of the stilet had a small bulb, which filled up the end of the cannula, and made it pass more easily down to the stricture. The other end was a portcrayon, that contained the piece of caustic which was introduced through the cannula, and applied to the stricture. The portcrayon being guarded within the cannula, the whole was then withdrawn.

As Sir Everard Home remarks, this method was found in practice to be liable to many objections. The silver cannula could not be adapted to the flexible canal of the urethra. Hence, when the caustic was applied, and any degree of pressure employed, the effect of the caustic was necessarily produced upon the angle between the stricture and side of the urethra, and not upon the middle of the stricture, the part intended to be destroyed. Mr. Hunter not only saw the inconveniences of the cannula, but devised a more simple and commodious method of applying caustic accurately to the centre of the stricture.

* A Treatise on Strictures of the Urethra, containing an account of improved methods of treatment, &c. by James Arnott, p. 73. 8vo. Lond. 1819.

Sir Everard Home explains the improved mode as follows : Take a bougie, of a size that can be readily passed down to the stricture, and insert a small piece of lunar caustic into the end of it, exposing the surface of the caustic, but surrounding it every where laterally by the substance of the bougie. This should be done some little time before it is used; for, the materials, of which the bougie is composed, become warm and soft by being handled in inserting the caustic; and therefore the hold, which the bougie has of the caustic, is rendered more secure by the instrument being allowed to cool and become hardened.

This bougie is to be oiled; but, before passing it, a common bougie of the same size is to be introduced down to the stricture, in order to clear the canal, and to measure exactly the distance of the stricture from the external orifice. This distance being marked upon the armed bougie, the latter is to be passed down to the stricture, as soon as the common one is withdrawn. In its passage the caustic can scarcely come into contact with any part of the lining of the urethra, as the point of the bougie, of which the caustic forms the central part, always moves in the middle line of the canal; and, indeed, the quickness with which it is conveyed to the stricture, would also prevent any injury of the membrane.

When the armed bougie is in contact with the stricture, it is to be steadily retained there, with a moderate degree of pressure at first, which is to be afterwards diminished, or else it would bend the bougie when this becomes softened by the warmth of the urethra. The time which it is to remain, depends a good deal on the sensations of the patient, and the length of time the parts have been diseased; but, on the first trial, it should be less than a minute, as it then commonly gives greater pain, than at any subsequent application. Every other day appears, in general, to be as often as it is prudent to apply the caustic. In obstinate cases, however, Sir E. Home has applied it every day, and I have often done the same myself.

The bougie introduced before the armed one, should be made of soft materials, that it may mould itself to the form of the passage, and communicate information relative to the size and position of the stricture.

Mr. Arnott has lately proposed a new method of applying the caustic. Having sounded the canal, and ascertained the size of the passage through the stricture, he passes a full-sized cannula down to it, and then through this the caustic prepared in the following manner. A short cylindrical bit is chosen, of a diameter rather less than the stricture, and pierced so that

a wire may pass through its axis. The wire has a ring-handle, and is a little longer than the cannula. Half an inch of it is then passed through the caustic, and is covered by a piece of common bougie, in order that it may pass through the stricture, without chance of wounding the urethra; and behind the caustic, another portion of the wire is surrounded by bougie, in order that the caustic may be firmly held half an inch from the point of the wire. The wire, thus armed, is passed down the cannula, and the bougie point entering the stricture, conducts the caustic exactly into it. During the introduction, the cannula has its open extremity filled and rounded by a button projecting from it, and when close down, the button is withdrawn, together with the wire, to which it is fixed. On the other end of this wire, a little dossil of lint is fixed, which is introduced before the caustic, for the purpose of absorbing any superfluous moisture at the stricture, and it is also introduced after the caustic, in order to take up any of this substance which may be dissolved, and apt to spread in the canal. In this mode of using the caustic, the projecting piece of bougie obviates all risk of hemorrhage from the corpus spongiosum being burnt, and a false passage produced, which recommendation, with other alleged advantages, is strongly urged by the author. When no other bougie will pass, the foregoing plan is inapplicable.*

The pain arising from the application of the nitrate of silver, or lunar caustic, to strictures, is represented by Sir E. Home as much more moderate than might a priori be apprehended. This gentleman has even related instances in which the piece of caustic slipped out of the bougie, and remained in the urethra; yet without occasioning any very severe symptoms.

In the course of the use of caustic bougies, especially when the patient is guilty of any imprudence, it is possible for some uncommon symptoms to arise.

The first is a swelling in the perineum. It is very apt to be brought on when the surgeon is endeavouring to remove that part of the stricture which is nearest to the sides of the urethra. The swelling, which is of considerable size, is totally different from that which is produced by the irritation of the long continuance of bougies in the passage, and which ends in an abscess. It is entirely caused by blood extravasated in the cellular membrane, and which is readily absorbed. The inflammation is also slight, and soon subsides. A second effect of caustic, in some particular cases, is a very profuse

* Arnott on Strictures, p. 143.

hemorrhage. According to Sir E. Home the bleeding never occurs with violence, except when the stricture has been completely destroyed. This gentleman has related several examples of such hemorrhage. Perhaps one of the most alarming bleedings that ever took place from the urethra from such a cause, occurred in a patient of my own, whose case I have elsewhere related. *

The instrument described by Mr. Arnott under the name of the dilator, and which I shall presently speak of, he says will serve for stopping such hemorrhage instantly. With it, pressure may be made either on the bleeding vessels, or behind them, while the anterior extremity of the urethra is closed. †

A third ill consequence, sometimes induced by the use of armed bougies, is strangury. According to Sir E. Home, it is not common for caustic to produce this effect. On the contrary, he states, that, in many instances, it removes it, by taking off spasmodic action from the stricture. Patients, however, who are subject to occasional retentions of urine from the use of common bougies, are also not less liable to the complaint, when they are using armed ones, and sometimes they suffer in a still worse degree.

In certain constitutions, it appears also, that the application of caustic to a stricture brings on an attack of ague. This effect is said to be most common in patients, who have passed a good deal of their life in hot climates. It sometimes happens, however, in persons who have never been out of England. I saw in St. Bartholomew's hospital, a few years ago, an elderly man, who had very bad strictures, for which the caustic was used. After the plan had been followed about a fortnight, a serious shivering fit came on directly after the application of the bougie. The method was discontinued for a time, and the man's health got rather better. The caustic was now again resorted to, and again a most violent rigor immediately followed, and the febrile indisposition, which took place, proved fatal in a couple of days.

Caustic bougies are at present much less employed than they were ten or fifteen years ago. In France, however, and upon the continent in general, the practice never gained any partisans. The chief inducement which rendered the plan a favourite one with many surgeons some time ago, depended upon its alleged superiority in radically curing strictures, and leaving no chance of a relapse. I believe, however, that

* See Edinb. Med. and Surg. Journ. vol. v. p. 333.

† Arnott on Stricture in the Urethra, p. 153.

this was only a supposition; for, I have seen several returns of stricture after the use of caustic; and, if the disease should recur rather less frequently, on the whole, the success may be ascribed rather to the larger size of the armed bougies ordinarily employed. In short, I have no doubt, that common bougies would permanently cure strictures, quite as well as any armed ones, if care were taken to increase the size of them in a proper degree, in proportion as the obstruction gives way.

For those strictures, however, which are like what would be produced by tying a piece of packthread round the urethra, perhaps armed bougies generally answer very well. They have also been particularly recommended for irritable strictures, the irritability of which is said to be destroyed with the diseased part of the canal. There are some cases, in which no bougie, nor catheter of the smallest size whatever, can be got through the obstruction. Here the surgeon has the choice of using the armed bougie; of exciting ulceration of the stricture with the pressure of a common one; or of imitating the French, and some of our own surgeons, in boldly forcing a way through the obstruction with a conical silver catheter, of which I shall presently speak.

METHOD OF USING BOUGIES ARMED WITH CAUSTIC POTASSA.

Mr. Whately considers strictures of the urethra not merely as contracted fibres, but as really diseased portions of the membrane lining that canal, with a continued disposition to increased contraction. Hence, he approves of a remedy, calculated both to remove the diseased affection, and to dilate the contracted part, without putting the patient to the inconvenience of wearing a bougie. Such a remedy he thinks caustic, when it is judiciously used. But, his great object is to recommend the employment of the caustic potassa in a particular manner, as being, according to his account, more efficacious, and less painful and hazardous, than bougies armed with lunar caustic.

Before the caustic potassa is used, the urethra should be rendered sufficiently capacious to admit a bougie, above the smallest size, into the bladder, and the strictures, if very irritable, should have this irritability previously lessened by the use of common bougies.

The bougie is armed with the caustic potassa as follows: put a small quantity of this caustic upon a piece of strong paper, and break it with a hammer into small pieces, about the size of large and small pins' heads. Thus broken, it should be kept for use in a phial, closed with a ground stopper.

The bougie should have a proper degree of curvature given to it, by drawing it several times between the finger and thumb of the left hand, and it should be just large enough to enter the stricture with some degree of tightness. Then let it be passed gently into the urethra, and when its point stops at the stricture, which it almost always does before it will enter it, make a notch with the finger-nail on the upper portion of the bougie, exactly half an inch from the extremity of the penis. When the bougie is withdrawn, a small hole, about the sixteenth part of an inch deep, should be made at the extremity of its rounded end. Some of the broken caustic should then be put upon a piece of paper, and a bit smaller than the smallest pin's head, is to be selected for the first application. Let this be inserted into the hole of the bougie with a pocket knife, and pushed into it with the blunt end of a pin, so as to make the caustic situated rather below the margin of the hole. To prevent the caustic from coming out, the hole should then be contracted a little with the finger, and the remaining vacancy in it filled with hog's lard. The bougie, being oiled, is to be passed with the curvature upward, to the anterior part of the stricture, the situation of which has been ascertained before-hand, and the bougie marked as already explained. The instrument should rest there for a few seconds, that the caustic may begin to dissolve. It should then be very gently pushed forward, about one-eighth of an inch, when there should be another stop for a second or two. The bougie should next be carried forward in the same gentle manner, till it has got through the stricture. After this, it should be immediately withdrawn, by a very gentle motion, to the part, at which it was first made to rest awhile. Then it should be very slowly passed through the stricture a second time, but without letting the bougie stop in its passage. If pain or faintness arise, the operation is now to end, and the bougie is to be immediately withdrawn; but if no such effects should be produced, the instrument may be passed, and withdrawn, once or twice more, before concluding the operation, which will occupy about two minutes.

The application is to be repeated once every seven days, and if the stricture be found dilated, the bougie must be proportionally increased in size every time. The piece of caustic, in no cases whatever, ought to be larger than a common pin's head.

By the above procedure, Mr. Whately asserts, that the caustic potassa is equally diffused over every part of the strictured surface, and only *abrades* the membrane of the stricture, without producing a slough.

Whoever wishes further information concerning this method of treatment, must consult Mr. Whately's publication.* In cases in which the stricture occupies some extent, I should prefer instruments which operate on the principle of dilatation; and, when the contraction is such as would arise from tying a piece of packthread round the urethra, I should prefer either similar means, or bougies armed with the nitrate of silver.

TREATMENT OF STRICTURES WITH FLEXIBLE METALLIC BOUGIES, OR SOUNDS.

For some years past, a new plan has prevailed of treating strictures in the urethra with bougies composed of a soft, flexible metal. The instruments also have a highly polished surface of a silvery hue, and as the diameter of some of them is considerable, they possess a sufficient degree of firmness, both for introduction, and for retaining the curve of the patient's urethra. This last circumstance, indeed, is considered by some practitioners a great advantage, exclusively belonging to metallic bougies. Hence, as soon as they have received the curvature which is judged to suit the patient best, they are carefully preserved in this form throughout the cure, and are kept in a case which has a corresponding shape. Formerly I have heard of objections to these instruments, on the ground of their being liable to break in the urethra; but although they are now often used, I have not been acquainted latterly with such an accident. Perhaps, this is to be imputed partly to their present composition, which is firmer, and less flexible, than it used to be some years ago, and partly to their present greater diameter. Many patients bear the employment of metallic bougies better than any others. It seems only necessary to add, that they effect a cure on the principle of dilatation, like common bougies.

TREATMENT OF STRICTURES WITH A CONICAL SILVER CATHETER.

It is remarkable, that the French surgeons, who have always objected to the use of armed bougies, which appear to them too violent a means of cure, have set the example of treating strictures in the urethra on the principle of actual force. I cannot explain this matter to the reader better, than by quoting what Mr. Cross, an intelligent surgeon at Norwich, who visited the hospitals of Paris a little while ago, has said upon the sub-

* An improved Method of treating Strictures in the Urethra.

ject. "When I first went to La Charité (says this gentleman), out of fifty-three male patients in the surgical ward, there were five cases of stricture of the urethra, and three or four of diseases of the testicles. In the treatment of the former complaint, the caustic bougie is not used in any of the hospitals, and it was censured by all the surgeons I met with as '*a very dangerous and harsh remedy*,' which I believe most of them have never given a trial. It appears to me, however, that the Parisian method of treating many cases of stricture in the urethra, is not more mild than the use of the caustic." Mr. Cross then recites a case which he saw in La Charité. A man, who had had for a long while a permanent stricture, had been repeatedly treated for it. There was difficulty of making water, but not complete retention. Unsuccessful attempts were made, for several days, to pass an instrument into the bladder by gentle means. The patient was still able to void his urine, although with great pain and difficulty. Mr. Roux took a conical silver catheter, with a very slight curvature, and an extremity almost pointed, and by force, regularly applied, he made his way into the bladder in spite of all opposition. He took care to keep the instrument central, and to judge of the direction of the point by the lateral rings. The rule mentioned by M. Roux, for commencing the great depression of the outer extremity of the instrument, was, when by the finger in the rectum, he could feel the point to have reached the apex of the prostate. He gave great pain to the patient, but succeeded in getting the instrument into the bladder. The urine in the bladder was not suffered to flow out immediately, the catheter being left in the urethra, and its end plugged up with a piece of wood. Mr. Cross well observes, that M. Roux acted very judiciously in directing the catheter to be kept depressed between the thighs, because from its shortness, and the smallness of its curvature, the bringing of the outer extremity of the instrument up to the abdomen would have drawn the other extremity out of the bladder.

Three or four days, is the time M. Roux commonly keeps the conical catheter in the passage; but, this patient suffered so intolerably, that it was taken out at the end of four-and-twenty hours. An elastic gum catheter, of rather a small size, was immediately introduced without difficulty; its extremity fastened to the abdomen; and its orifice plugged up, in order that the urine might be allowed to flow only at certain periods. The next day, the patient was comparatively easy. On the fourth day there was a swelling of the testicle, scrotum, and perineum. A poultice was applied, and the

elastic catheter continued. In four days more, the swelling of the parts had subsided, and the poultice was no longer necessary. A fresh gum catheter, of a larger size, was introduced. Suffice it here to add, that, in about six weeks, a catheter of the largest size could be introduced.

Another case went on less favourably. The *sonde conique* had been employed, and a gum catheter introduced. But, in less than a week, the patient, believing he could make water without the instrument, took it out himself. The next day, an effusion of urine in the scrotum had taken place, and the fluid was freely let out by two long incisions. The elastic catheter, however, could not be introduced again. The urine now came away in drops from the urethra. The free incisions in the scrotum prevented sloughing; but the patient, who was very weak, and in bad health, died in a few days. It was (observes Mr. Cross) an inveterate case of stricture, and the patient would probably have died under any treatment. Dissection shewed a diseased bladder, whose coats were above half an inch in thickness, a cartilaginous stricture, and extensive sinuses communicating with the once membranous part of the urethra.

"The effecting of a speedy cure, in bad cases of stricture," is the argument advanced by the French surgeons for the use of the conical catheter, where that of elastic gum cannot be introduced without its assistance. They tell us, (says Mr. Cross,) even of bad cases being cured, or greatly relieved, in a month, or six weeks; and certainly in one case, under M. Roux, a catheter of the largest size could be received by the urethra, a month from the introduction of the conical catheter.

M. Roux assured Mr. Cross, that he had never seen any inflammation, or irritation, from this treatment, which was not readily managed and subdued. In his clinical lecture, however, he mentioned two fatal cases which he had witnessed, and examined after death. In one of these, on taking out the *sonde conique d'argent* the third or fourth day after its introduction, the surgeon could not introduce the gum catheter; in attempting to do which (said M. Roux), another passage seemed to have been made. Extravasation of the urine, sloughing, and death ensued. The second case was somewhat similar: peritoneal inflammation was the immediate cause of its fatal termination, the instrument having passed between the pubes and anterior part of the bladder.

Whoever desires more information respecting this violent mode of treating strictures, must consult Mr. Cross's *publica-

* Sketches of the Medical Schools of Paris, p. 111, &c. 8vo. Lond. 1815.

tion. Enough, I conceive, has been said, to prove that it is a dangerous plan, which can only be justifiable in the most inveterate and obstinate cases. It seems, that, in such examples, the late John Hunter, Desault, Mr. Dease of Dublin, and others, used the silver catheter with considerable force; and the practice of Mr. Pearson and Mr. A. Cooper is likewise cited, as a sanction of this bold mode of proceeding. The French even sometimes prefer this way of puncturing the bladder, the catheter being forced through the prostate gland; and I have heard of one or two distinguished surgeons in this country, who never perform any of the ordinary methods of puncturing the bladder, but invariably succeed in getting a catheter into that organ, by forcing the instrument forward through the prostate gland.

Another modern writer, who, perhaps with considerable reason, censures the above hazardous mode of forcing a conical sound, adopts the practice of cutting down to the stricture, after introducing a silver catheter, and then pierces the obstruction with a trocar. "The stricture (says he) is here the cause of the obstruction: why should it not be opened and the bladder relieved? since it not only affords a passage to the confined urine, but lays a foundation for a radical cure. This operation, when performed for a stricture of the urethra, (not curable by other means,) and where there is no complication, nor destruction of parts by the extravasation, is perfectly successful. I believe this manner of relieving the bladder would be more followed, if surgeons were aware, by as many proofs as I have before me, that *the membranous part of the urethra is always dilated in stricture.*"* The same author further assures us, that, in upwards of a hundred cases of obstructed urethra, examined by dissection, he has not found one, where the canal was obstructed further back than that part (naturally narrow) where the urethra is embraced by the ligament suspended to the os pubis, or where, in tracing it backwards, it leaves the bulb of the spongy body. And, uniformly, where there has been a narrow stricture in the urethra, that portion of the canal, which is called the membranous part, and also that which is embraced by the prostate, were found remarkably dilated.

On this head, says Mr. Charles Bell, I enter a protest against the advice contained in the following passage. "If the catheter could be thrust through this obstruction, and driven into the bladder, even at the expense of some violence and much blood, would such rudeness be fatal? by no means;

* C. Bell, *Surgical Observations*, vol. ii. p. 56. 8vo. Lond. 1818.

such an operation would, on the contrary, give present relief." What a licence (continues Mr. Bell) is here for heavy heads and hands! But, what follows is worse. "Dease, a man intrepid and fearless, and who had not (perhaps to a surgeon it is no reproach) all the delicacy and gentleness of nature, which was so justly admired in Dr. Hunter, was in the habit of driving his catheter right onwards into the bladder, when at any time gentle means, and art and cunning failed: he allowed no degree of difficulty to frighten him from his purpose." The practice (says Mr. Bell) is most dangerous, and the worst that ever was divulged. He entreats his readers never to yield to the temptation here held forth. It were better (he asserts) to puncture the bladder at all the three places at once, than that such a liberty as this should be granted to a young surgeon.*

Whether a suggestion, contained in a late publication, will be found effectual enough in practice to supersede the necessity for resorting to the foregoing violent method, in cases of retention of urine from very close strictures, time and experience will soon determine. In examples of this description, small instruments have been usually preferred, in order that they may pass through when the spasm has yielded; but, says Mr. Arnott, in pressing against a stricture with a point, unless it bear upon the orifice, it can have no tendency to open it, and there is danger of piercing the side of the canal. It has not been recollected, that a large instrument pressed against the stricture, and not expected to pass through, will frequently open it more certainly than a small one. We see, says this gentleman, a hole in an elastic substance greatly stretched by pressing a ball, or rounded end against it; and such is indeed often the best and most certain means of opening a narrow stricture. Here the plan of passing down to the stricture a large cannula, which has a rounded end, and incloses an instrument, is conceived by Mr. Arnott to be very applicable. Pushing the cannula against the stricture opens it, while the small bougie, or catheter within it, is ready to be passed through.†

OF THE NEW INSTRUMENT CALLED A DILATOR, LATELY PROPOSED FOR THE CURE OF STRICTURES.

In treating strictures on the principle of dilatation, the great desideratum has been an instrument, which could be

* C. Bell, Surgical Obs. vol. ii. p. 57.

† Arnott, in Treatise on Stricture in the Urethra, &c. p. 120.

easily passed through the stricture, and any part of which could then be increased in diameter to any size, and with any force; and be again reducible to its primitive small bulk, when the surgeon wishes to extract it. The dilator, invented by Dr. Arnott, is said completely to answer the purpose. This apparatus consists of a tube of oiled silk, lined with the thin gut of some small animal to make it air-tight, and then attached upon the extremity of a small cannula, by which it is distended with air, or water from a bag, or syringe at the outer end, while a stop-cock, or valve, serves to keep the air in when received. The manner of using this instrument is as follows: though in general it passes as easily down to the stricture as a small bougie, Mr. Arnott says, he has sometimes preferred introducing it through a smooth cannula, especially when the urethra was irritable, and unaccustomed to the presence of instruments. As soon as the bag is sufficiently within the stricture, or strictures, as much air is to be injected into it, as the patient can easily bear. Much pain should never be given by the distention. The dilator is said to act with more effect than a bougie, which, as soon as it yields, loses its power of distention, while the force of the dilator is concentrated at the stricture, and unceasing.* As I have not yet had an opportunity of judging of the merits of Dr. Arnott's dilator, I wish at present merely to mention the nature of the instrument. In principle, it is exactly like the contrivance used by Bromfield for dilating the female urethra, for the purpose of extracting a calculus, as indeed the author himself acknowledges; but, for the perfection to which the contrivance has been brought, and for the suggestion of an immense number of circumstances, under which it may prove useful, the profession are unquestionably altogether indebted to Mr. Arnott, and his brother, with which last gentleman the invention of the particular instrument, termed the dilator originated.

According to Mr. Arnott, a modification of the dilator will also furnish a perfect urethra sound, for discovering not only the length of strictures, but their number and relative situations. The cannula of the dilator sound should be stiff, and very narrow, and the bag very short, nearly of the natural diameter of the urethra, with its extremities as flat as possible. It is introduced down to the first stricture, and the distance from the orifice of the urethra observed; letting out the air, it is then passed through the stricture, again dis-

* See Arnott's Treatise on Stricture in the Urethra, &c. p. 96, &c.

tended, and retracted, till the posterior surface of the same stricture opposes it. The distance of this further extremity of the stricture is marked, and the space between this mark and the first, shews the extent of the urethra occupied by the stricture. The instrument may now be passed to another stricture, and the same process repeated, if deemed necessary.*

OF A NEW PASSAGE.

Mr. Hunter accurately informs us, that the greatest evil arising from the improper use of the bougie, and the most dangerous, is the formation of a new passage. This is generally occasioned by an attempt to force a way through the stricture with a firm inflexible instrument like the conical silver catheter, or to excite ulceration by the application of the end of the bougie to the stricture, when this instrument cannot be passed through it. It may also be produced by caustic. An argument against the use of caustic, is the danger of its burning a new or false passage, either in the body of the penis, or, more commonly, through the cellular substance, between the urethra and the rectum. The difficulty of guiding the caustic with accuracy, and of discovering the length of the stricture, must show, as Mr. Arnott observes†, that, in the attempt to burrow through one of the long kind, there are many chances of the caustic leaving the line of the urethra; and even in short strictures, when they are hard, the same disastrous occurrence is liable to happen from the caustic solution acting chiefly on the lower side of the canal. On account of the risk of a caustic bougie taking a wrong direction, the rule in practice is occasionally to trace, with a soft bougie, the course which the former instrument is taking. According to Mr. Arnott, however, in his mode of using caustic, a mode already noticed, there can be no danger of a false passage. After such an evil has once happened, however, a bougie cannot be prevented from going into the new passage, and is completely hindered from acting on the stricture.

In this circumstance, Mr. Hunter recommends the following operation. Pass a staff, or any such instrument, into the urethra, as far as it will go, which will probably be to the bottom of the new passage, and this, we may be certain, is beyond the stricture. Feel for the end of the instrument externally, and cut upon it, making the wound about an inch long, if the disease be before the scrotum; and an inch and a

* Arnott, *op. cit.* p. 138.

† *Ibid.* p. 137.

half, or more, if in the perineum. If the new passage be between the urethra and body of the penis, you will most probably get into the sound urethra, before you come to the instrument, or new passage. If so, introduce a probe into the urethra, through the wound, and pass it towards the glans penis, or, in other words, towards the stricture. When it meets with an obstruction, this must be the stricture, which is now to be got through, and afterwards dilated. To complete the operation, withdraw the probe, and, instead of it, introduce a hollow cannula forwards to the stricture. Then introduce another cannula from the glans downwards, till the two tubes are opposite each other, having the stricture between them. An assistant is now to take hold of the urethra on the outside, with his finger and thumb, just where the two cannulæ meet, in order to keep them in their places. Through the upper cannula next introduce a piercing instrument, which is to perforate the stricture, and enter the lower cannula. The piercing instrument is now to be withdrawn, and a bougie introduced through the first cannula and stricture, into the second cannula. The tubes are to be taken out, and the end of the bougie, in the wound, directed into the bladder, through the further portion of the urethra. It may also be necessary to lay the whole of the false passage open, in order to make it heal, for, otherwise, it might still obstruct the future passage of bougies into the proper canal.

If the new passage be between the skin and urethra, the surgeon must extend his incision more deeply, for the purpose of finding out the natural passage. Then he is to proceed as above explained.*

The longer the first bougie is allowed to remain in the canal, the more readily will the second pass. The bougies must be gradually increased in size, and used till the wound is healed. The only improvement, which seems proper to be made in this plan, is to employ hollow bougies, or flexible gum catheters, which might be worn longer than common bougies, as the patient could void his urine through them.

Mr. Arnott gives the following direction for ascertaining the existence of a false passage. Let a small silver tube, with a very short dilator bag, or button at its end, of such a diameter, that when distended in any part of the urethra, it will prevent the passage of urine by its sides, be introduced as far as possible and dilated. If the urine flow by the side of the cannula, and not through it, we may be sure that a false passage exists,

† See Treatise on the Venereal Disease by J. Hunter, p. 137, &c. edit. 2.

and that the bag of the dilator has passed into it; while, as we withdraw the instrument, the change, from the urine passing by its sides, to its being discharged through the cannula, or its complete stoppage, will indicate the present seat of the stricture.*

CHAPTER XXIII.

FISTULÆ IN PERINÆO, AND EXTRAVASATIONS OF URINE.

WHEN the urethra is very much obstructed, nature often endeavours to procure relief by ulceration on the inside of that part of the urethra which is within the stricture. Hence, the urine insinuates itself into the loose cellular membrane of the scrotum and penis. The extravasation of this fluid becomes the cause of suppuration, wherever it is diffused, and even of mortification†, first of all the cellular substance, and then of several portions of the skin. If the patient survives, all these sloughs are detached, leaving a free communication between the urethra and external surface. Every opening, thus produced, is termed a *fistula in perinæo*.

Sometimes the urine finds its way into the corpus spongiosum urethræ, becomes diffused through the whole of this texture, and injected into the glans penis, occasioning mortification of the parts in which it is lodged. It appears also possible for the urine effused, in consequence of ulceration of the urethra in cases of stricture, to pass into the cavernous substance of the penis, instead of into the common cellular membrane. In one example of this kind, as recorded by a modern writer, erections from this cause had taken place, followed by mortification.‡ Even when the urine is contained in the common cellular membrane of the scrotum, the irrita-

* Arnott, op. cit. p. 161.

† “ Il n'est point de fluide dans l'économie animale, dont l'épanchement soit aussi funeste que celui des urines. Si on n'en procure promptement l'évacuation, elles excitent bientôt une suppuration putride dans le tissu cellulaire qui le contient, et le font tomber en pourriture, attirent sur la peau une inflammation gangréneuse, frappent enfin presque toujours de mort les parties qu'elles abreuvant.” Œuvres Chirurg. de Desault par Bichat, tom. iii. p. 280. edit. 1803.

‡ C. Bell, Surgical Observations, vol. i. p. 98

tion may produce suppuration in the corpus cavernosum.* The instances upon record are numerous, in which the lodgment of calculi at the stricture, and the increased obstruction thereby produced, have led to ulceration of the urethra, and a dangerous or fatal effusion of urine.

In particular instances, however, where the urine is extravasated, the fluid does not spread so extensively as above represented; but, on the contrary, it is confined in a sort of pouch, its diffusion being prevented by the adhesive inflammation; and, on other occasions, instead of insinuating itself extensively into the cellular membrane, it is not only circumscribed, but presents itself in a purulent form, having excited inflammation and suppuration in the part. These circumscribed partial effusions of urine are never seen, except in cases where the urethra is either not obstructed at all, or only imperfectly so; for, when the stricture is complete, and no urine whatever can pass, if the urethra ulcerate, the contents of the bladder always flow so suddenly and copiously into the cellular membrane, that the extravasation immediately occupies a considerable extent. It is clear also, that, while no outlet for the urine exists, the effusion must continue to spread, and the mischief to extend.

Abscesses in the perineum, sometimes communicating with the urethra, and sometimes not, may be brought on by the irritation of bougies in the treatment of stricture; a fact of which all surgeons should be aware.

TREATMENT.

When the effused urine forms only a circumscribed tumour, an incision may be made into the swelling, and an elastic gum catheter introduced and worn. When the effusion is extensive, and strictures are the cause, a complete cure cannot be accomplished without removing them. But, in general, this indication cannot be fulfilled in time to prevent all the mischief arising from the extravasation of urine. An attempt indeed should be made to pass a bougie; for, sometimes, the stricture is, more or less, removed by the ulceration. When this is the case, Mr. Hunter advises the almost constant use of bougies, in order to procure a passage onward into the bladder. However, if it were possible, in this state of things, to introduce a bougie through the whole course of the urethra, there can be little doubt, that the most advantageous plan

* C. Bell, Surgical Observations vol. i. p. 102.

would be that of making the patient keep an elastic gum catheter continually in the passage. This instrument would at once conduct the urine outward, hinder any more from being effused, and act, like a bougie, on the remains of the stricture. In cases of this nature, the larger the catheter is which can be introduced the better, as it will not only act more quickly on the remains of the stricture, but will be more likely to hinder a further extravasation of urine.

While measures are taken for curing the stricture, every thing calculated to diminish inflammation, is to be put in practice. Proper incisions for the discharge of the urine, emollient poultices, and fomentations, bleeding, and exposing the parts to the steam of hot water, are especially proper. Opium, given by the mouth, and in clysters, and the employment of the warm bath, are the best means of lessening any spasmodic affection. Too frequently, however, no bougie, nor elastic gum catheter, can be introduced; the evils arising from the effusion of urine are pressing; and no immediate hopes of overcoming the obstruction can be reasonably entertained. Here indeed we may try the method spoken of by Mr. Arnott, which consists in introducing a full-sized cannula down to the stricture, for the purpose of dilating the urethra immediately in front of the stricture, whereby the latter will be put in a more likely condition to admit of the passage of any small bougie, or catheter, introduced down to it through the cannula than would otherwise be the case.* There are also examples, in which the surgeons in France often pursue the plan of forcing a way, through the stricture, into the bladder with a conical silver catheter, which they keep in for a few days, notwithstanding the pain and irritation which it usually excites, and then substitute for it a small elastic catheter, which is gradually increased in size. As I have explained, however, in the chapter on strictures, this method is attended with great risk of the urethra being ruptured, and should never be attempted except by a very experienced and skilful man. When no bougie, nor ordinary catheter will pass, some surgeons have occasionally ventured upon the bold plan of endeavouring to perforate the stricture, by means of a stilette passed down to the obstruction through a cannula.

In the cases under consideration, we are advised by Mr. Hunter to endeavour to unload the bladder, and prevent the further effusion of urine into the cellular substance, by

* Arnott, Treatise on Stricture, &c. p. 120

making an opening into the urethra, somewhere beyond the stricture; but the nearer to it, the better.

Introduce a director, or staff, into the urethra, as far as the stricture. Cut down on the extremity of the instrument, and extend the incision a little farther towards the anus, so as to open the urethra beyond the stricture.*

When the stricture is opposite the scrotum, Mr. Hunter recommends making an opening into the urethra in the perineum; but, here, we cannot have the end of the staff to guide us, and we must trust to our anatomical knowledge. The rest of the operation resembles that for the cure of a false passage. A flexible gum catheter should then be introduced, and the wound healed.

Great attention should still be paid to the inflammation, produced by the diffusion of the urine. Free incisions ought to be made, in order to give vent to this fluid as well as the purulent matter. When there are sloughs, of course the surgeon ought to prefer dividing them to cutting the living parts; yet this consideration must not lead him to omit making the requisite openings in the most depending situations.

When the total obstruction of the urethra and the extravasation are ascertained to depend upon the lodgment of calculi at the stricture, the plain indication is of course to make an incision down to the extraneous substances, and extract them.

Practitioners, unaccustomed to see the consequences of urinary extravasations, would be alarmed at the magnitude of the ulcer, which is occasionally left after the detachment of the sloughs. Sometimes the whole scrotum and the integuments of the penis, groins, perineum, and upper part of the thighs, are attacked with mortification, and the naked testicles are seen in the middle of the enormous sore, suspended by the spermatic cords.† It is hardly conceivable, how cicatrization can take place over the testicles, thus denuded; but the resources of nature are found to be infinite. She causes the testicles and spermatic cords to unite to the subjacent parts, and, by drawing the skin from the circumference towards the centre of the sore, she covers those organs, and forms for them a new investment, like a scrotum. This statement, says Bichat, is founded on a vast number of cases, in which nature was seen to pursue this course. The healing of the ulcer, indeed, is far quicker than

* *Treatise on the Venereal Disease*, p. 146. edit. 2.

† See Cases illustrating these observations in Mr. C. Bell's *Surgical Observations*, vol. i. p. 90—94.

might be expected, considering its great extent. Now, in all this salutary change, what does art effect? If, observes Bichat, we except the introduction of the catheter, which is absolutely necessary for a complete cure, (and, he might have added, the practice of making timely incisions for the discharge of the effused urine,) surgery can afford the majority of patients little, or no useful aid; for, when they are not debilitated by the long existence of the disease, are of good constitutions, and in the vigour of life, they recover with as much expedition and certainty under a proper regimen and with simple dressings, as if internal medicines, and a farrago of topical applications were employed. In short, adds Bichat, the practice at the Hotel Dieu consists in applying emollient poultices, until all the sloughs have separated. The ulcer is then sometimes dressed with pledgets, or with dry lint, which is continued to the end of the treatment. When any complication occurs in the course of the case, an endeavour is made to remove it by such means as are suited to the indication which it presents. Thus, when there is prostration of strength, bark and cordials are exhibited. But, in every instance, the elastic gum catheter is to be regarded as the essential means of cure: without this instrument, the recovery is almost always imperfect, and the sore leaves several urinary fistulæ.*

In old cases of fistulæ in perinæo, where the dangers, arising from the diffusion of urine, are past, the surgeon is to endeavour to make the natural passage as free as possible by the use of bougies and catheters; for the fistulous openings in the perineum often heal up spontaneously, as soon as the urine finds a ready passage forwards through the urethra.

When the fistulæ in perinæo do not heal, after the complete removal of the stricture, they are to be laid open, in the same manner as other sinuses which have no disposition to heal. In doing this, as little as possible of the sound part of the urethra must be opened. Hence, the surgeon must direct himself to the inner orifice of the fistulæ, by means of a staff introduced if possible into the bladder, and a probe passed into one of the fistulous passages. Here it is essential to remark, that however numerous the external openings may be, fistulæ in perinæo never have more than one internal opening, by which they communicate with the urethra, and which is almost invariably on the inferior side of the canal, or that nearest the external surface of the body. The probe should be first bent,

* Œuvres Chir. de Desault par Bichat, tom. iii. p. 286, 287.

in order that it may more readily follow the turns of the *fistula*. When it can be made to meet the staff, so much the better; for then the operator can cut just what is necessary.

When the fistula is so straight as to allow a director to be introduced, this instrument is the best. If, as Mr. Hunter observes, neither the probe nor the director can be made to pass as far as the staff, we must open as far as the first instrument goes, and then search for the continuation of the passage, for the purpose of opening it.

Having divided the fistulæ, as far as their termination in the urethra, a flexible gum catheter should be introduced, and worn at first almost constantly. When the sores become stationary, however, it is better to withdraw the catheter, and only introduce it occasionally; for, its continual presence is sometimes found to prevent cicatrization.

At first, the dressings are to be introduced down to the bottom of the wounds, for the purpose of preventing the union of the parts, which have been just divided, and (to use Mr. Hunter's words) in order to make the granulations shoot from the bottom, so as to consolidate the whole by one bond of union.

Fistulæ in perinæo, attended with most unyielding strictures, may occur where it would be proper to cut through the obstruction, in the way recommended for the cure of a false passage; though we ought always to try the efficacy of bougies, before having recourse to such an operation.

Mr. Charles Bell has published an instance of this kind, which illustrates very well several circumstances of this form of the disease, and in particular the difficulties and embarrassments of attempting to trace in an operation the continuation of the urethra. In the case here alluded to, there was a firm stricture five inches from the orifice of the urethra. The scrotum, in consequence of repeated attacks of inflammation, was large and irregular. At the lower part of the scrotum there was a fistulous opening, through which the urine dropped. The perineum exhibited a singular appearance; being irregular, tuberculated, and as firm as a board. One tumour of more considerable size hung pendulous, having the form of a pear, and the hardness of stone. All the part was undermined with fistulous communications. The aperture, from which the greater part of the urine used to be discharged, was now closed. For three weeks, repeated attempts were made to pass the finest bougie through the stricture; and the common and catgut bougie, and the silver sound, were all tried in vain. Caustic seemed to Mr. C. Bell out of the question.

This gentleman was therefore led to plan the following operation. The urine was to be retained, and the testis, if possible, pushed up to the groins out of the way of the knife. The assistant, who did this, was then to take hold of the sound, which was to be passed down to the stricture. The operation was to begin by following the principal sinus with the scalpel, and the mass of parts was to be dissected back, so as to expose the spongy body of the urethra. The urethra was next to be opened in front of the stricture, and the end of the sound found. Then an endeavour was to be made to trace the passage backward through the stricture with a probe, on which the incisions were now to be made for the purpose of making way for the passage of the catheter onward into the bladder. This projected operation was however very different from what it was found practicable to execute.

As for dissecting the bulb of the urethra, it was impossible; it could not be distinguished. The mass cut into, was as firm and dense as a scirrhus tumour. The great thickness and firmness of the scrotum proved also a serious impediment to tracing the direction of the urethra with the probe, which, though it could be passed forwards, could not be conducted backwards towards the bladder. In this dilemma, Mr. Bell was obliged to cut out a portion of the callous urethra, and open the sinuses which ran backwards. As the urine had not been retained, as was wished, no light could be gained respecting the exact place of the inner opening of the urethra by an evacuation of that fluid, and it became therefore necessary to finish the operation by introducing a portion of bougie into that hole which seemed most like the urethra. In the evening the dressings were removed, when the patient made water from under the pubes in a full stream, and a full-sized hollow bougie was readily passed into the bladder. The wound was dressed with slips of lint dipped in oil, and covered with a poultice. After more than a fortnight, the silver catheter was withdrawn, and one of elastic gum introduced, which was some time afterwards again exchanged for the metallic instrument. In the meanwhile, the induration and thickening of the scrotum gradually diminished, and the pendulous tumour became smaller. At length, the catheter was left off, and a common bougie introduced once a day; but, neither this plan, the occasional introduction of a large silver catheter, nor any mode of dressing would entirely heal the wound; so that though the patient was extricated from all danger and every serious annoyance, a fistulous aperture after all remained, out of which, however, no urine flowed, when

the opening was pressed with the finger at the period of emptying the bladder, the fluid coming freely through the urethra.*

CHAPTER XXIV.

RETENTION OF URINE

SIGNIFIES that disorder, in which the urine cannot be expelled from the bladder. The disease has been described by the ancients, under the generic name of *ischuria*. Some writers have discriminated it from *dysury* and *strangury*, which are represented as particular cases; while others have considered these last only as different kinds of retention of urine. *Dysury* is applied to that example, in which the urine can only be discharged with pain and difficulty; *strangury* expresses that, in which the evacuation can only be made by drops; and *ischuria* denotes the case, in which no urine at all can be voided. Desault imputed this variety in the symptoms to different degrees of the same disease, and, therefore, he preferred the division into the complete and incomplete retentions.

When the evacuation of urine is prevented, the bladder generally becomes distended in an extraordinary degree. In an infant, eighteen months old, it has been found to contain a pint of fluid; and, in adults, six or seven pints. It has been known to occupy not only the whole cavity of the pelvis, but, also, to ascend into the abdomen, higher than the umbilicus. It has sometimes been observed to extend itself even through the abdominal ring, or under the crural arch, into the groin, so as to form an inguinal, or a femoral hernia. Such elongations of the bladder, it is true, are not common; yet many are upon record.† In ordinary cases of retention of urine, the bladder preserves nearly its natural figure. Its dimensions, however, are not all equally enlarged. It yields from below upwards, more than in any other direction. The lower part of this viscus becomes broader and more deeply situated, depressing the perineum; in women, pushing the vagina back-

* See C. Bell's Observations, vol. i. p. 128—135.

† See Recherches sur la Hernie de la Vessie, par M. Verdier; in Mém. de l'Acad. de Chirurgie, tom. ii. 4to. and the chapter on Cystocèle in the present volume.

ward; in men, the rectum; and occasioning in these passages a tumour, which more or less fills up their cavity, and which, in the intestine, may actually obstruct the evacuation of the feces. The posterior parietes of the bladder, covered by the peritoneum, push the small intestines upwards and backwards, and rise into the abdominal cavity; while its fundus, in rising above the pubes, glides, as it were, betwixt the peritoneum, which is lifted up, and the abdominal muscles. Its anterior superior part, which forms a swelling in the hypogastric region, is actually in contact with the recti and transversales muscles. This circumstance ought to be understood, because it shows, how the bladder may here be opened, without any danger of wounding the peritoneum, and causing an extravasation of urine. Not unfrequently, between the fleshy fasciculi of bladders, which have been much distended, pouches, or cells, are observed, containing calculi. When the urine has dilated the bladder to the utmost, without the obstacle to its natural escape through the urethra being removed, it next accumulates in the ureter, which, with the pelvis of the kidney, becomes enormously distended. The valvular contrivance, by which the ureter terminates in the bladder, now disappears, and the opening sometimes becomes nearly an inch in diameter. At length, there being actually no receptacle for more urine, the secretion is suppressed.

The diagnosis of the present disease is not attended with much difficulty. The rational symptoms, indeed, though numerous, are mostly equivocal; as, for instance, no urine having been voided for one or several days; its discharge by drops, or in small quantities at a time; a continual desire to make water; such efforts as precede the exercise of this function; the inclination still felt to empty the bladder, though the patient may just have voided as much urine as he ordinarily does; a diminution of the force, and stream of the fluid; a sensation of weight about the perineum; tenesmus; constipation; and hemorrhoids. To these ambiguous symptoms are to be added; acute pain in the hypogastric region, extending, along the urethra, to the glans penis, and, after a time, to the region of the kidneys; and pain, that is increased, when the patient walks, coughs, or holds himself in an upright posture, and that is diminished, by his inclining himself forward, so as to relax the abdominal muscles. Lastly, among the doubtful symptoms, are to be enumerated, fever, nausea, difficult breathing, sweats, with an urinary and ammoniacal smell, hiccough, vomiting, pain and tension of the belly, coma, convulsions, delirium, &c.

Notwithstanding the great number of the above symptoms,

they afford no certainty, with regard to the existence of a retention of urine, and the surgeon can only derive positive information from the swellings, formed by the distended bladder, above the pubes, and in the rectum, or vagina.

The tumour above the pubes varies much in its dimensions. Sometimes, it rises higher than the umbilicus. It is circumscribed, without alteration of the colour of the skin, and without any hardness at its circumference. It is broader below, than above; elastic; and not particularly painful, unless forcibly pressed; and then the desire to make water is increased, or some drops of urine even make their escape from the urethra.

The tumour in the rectum, or vagina, may be plainly felt. It only occupies their anterior parietes. It is throughout its extent elastic, smooth, and without any particular induration. But, a symptom, that highly merits the notice of the practitioner, is the fluctuation, or undulation, which is perceptible when the swelling above the pubes, and that in the rectum, or vagina, are touched together.

Every surgeon should be apprised, however, that these swellings are not constantly perceptible: complete retentions have been noticed, where, in consequence of the unyielding and contracted state of the bladder, this organ only contained a few spoonfuls of urine. *

A retention of urine is always an alarming disease, and, when complete, demands prompt succour. If relief be too long delayed, the consequences are most distressing; for, the bladder, when long distended, loses its contractile power, which can only be slowly recovered, if recoverable at all; and, what is still worse, if the stoppage of the urine be complete, and remain unrelieved a certain time, the bladder inflames, some point of it sloughs, and a most dangerous extravasation of urine follows, generally ending in the death of the patient.

The progress of these cases, when timely relief is not afforded, always varies according to circumstances. 1. When the bladder has been distended to a certain pitch, and the cause of the retention of urine is not such as to close the urethra, the contents of the bladder, at length, begin to be discharged by drops; yet, this viscus is not emptied; and though the distention and fulness do not augment, they continue in the same degree as they did previously to the escape of urine from the urethra. It is this sort of retention of urine which may last several weeks, without producing further dan-

* Œuvres Chir. de Desault, par Bichat, tom. iii. p. 112—116.

gèrous consequences. 2. When the disorder is owing to a total closure of the canal, through which the urine is naturally evacuated, the distention and fulness of the bladder continually increase, until at last this viscus inflames, a part of it sloughs, the urine is effused, and the patient loses his life. Sometimes, however, and, probably, when the slough is, as it were, only a speck, the bladder bursts at the affected point, the urine becomes diffused in the surrounding parts, and the patient becomes suddenly freed from the preternatural distention of that organ. The result of the case now depends on the situation of the slough in this viscus. For the most part, the breach is formed in the vicinity of the neck of the bladder, so that the urine is extravasated in the cellular membrane of the perineum and scrotum; and fistulæ in perinæo take place.* Sometimes the slough opens a passage for the urine into the rectum, and this fluid is suddenly discharged with the stools. The bladder occasionally bursts at its superior and anterior part, and the urine becomes diffused in the cellular substance of the abdominal muscles. When the fundus of this viscus bursts, its contents may be effused into the cavity of the abdomen, and the consequences be fatal. Sometimes, the urine is discharged at the navel. In this instance, a preternatural pouch forms, which occasions a fluctuating tumour at the umbilicus, and, at last, the swelling inflames and bursts. This occurrence is principally seen in children.† The bladder is seldom found ruptured; unless a slough has previously occurred.

In every retention of urine, two chief indications present themselves. The first is to procure, by some means or another, a timely evacuation of that fluid; in order to prevent the serious consequences already specified. The second is to obviate the causes, which hinder its expulsion from the bladder.

In this work, I can only consider the disorder as arising from three principal causes: namely; 1. weakness, or paralysis of the bladder; 2. inflammation of the urethra, or of the adjacent parts; 3. a spasmodic closure of the neck of the bladder, or of the urethra, whether arising from the action of the muscles in the perineum, from the contractile power of the membranous lining of the passage, or both these causes together.

* In the urethra, ulceration occurs, as we have described in the chapter on *fistulæ in perinæo*.

† One such case I have seen myself.

RETENTION OF URINE FROM PARALYSIS OF THE BLADDER.

In this case, the passage for the urine is open; but, the bladder has not the power of contraction. The nature of the disorder is distinguished by the foregoing cause, and by the facility with which the catheter can be introduced.

In persons of advanced age, the bladder becomes less sensible to the stimulus of the urine, and loses the power of contracting sufficiently to expel the whole of its contents. This is the first degree of the retention of urine, which is common to old subjects, and originates in a very gradual manner. The urine flows in a full, but a weak stream, and towards the end of every evacuation, the water only comes away by drops. The quantity of urine expelled at a time, by degrees gets smaller and smaller, until at last a perfect retention occurs.

This species of the disorder is often imputable to a pernicious habit of not taking a sufficient time to discharge the whole of the urine. Sometimes, it is owing to an injury done to the loins, and it is then usually attended with a paralytic affection of the lower extremities. Most frequently, it is produced by an unusual distention of the above viscus, whereby this is deprived of the power of contracting itself again. The distention occurs, either in consequence of retaining the urine too long, after an inclination to void it is first felt; or in consequence of another species of retention, which has only attained a certain degree.

The paralytic retention of urine is not so dangerous as the other kinds, especially those which are produced by a closure of the urinary passage. Inflammation and sloughing of the bladder seldom result from it. As the urethra is pervious, no sooner is the bladder distended in a certain degree, than the pressure of the abdominal muscles causes a partial discharge of its contents. The nature of this case is very liable to be misunderstood, on account of the urine dribbling away, and the usual quantity being evacuated in the course of the day; and, also, in consequence of the patient himself being able by an effort of the abdominal muscles, and pressing the lower part of the belly, to make the urine flow out in a stream.

The disease, in fact, is exceedingly apt to be mistaken by the inexperienced for one of a totally different description, namely, an incontinence of urine.

There are two indications, in the treatment of this kind of retention of urine; the first is to draw off the fluid distending the bladder; the second is to restore the natural contractile power of this receptacle, in accomplishing which latter object,

it is necessary to pay particular attention to the cause of the disease.

The catheter is the most certain means of drawing off the water, and its introduction should never be imprudently delayed, when the complaint has been of any duration; for, the distention of the bladder, and the loss of its contractile power, are continually increasing, and, of course, a radical cure is thereby rendered more and more difficult. It is only in very recent cases, that it is proper to be content with trying in the first instance such remedies as seem calculated to re-establish the contractile power of the bladder. With this latter view, fifteen or twenty drops of the *tinctura lyttæ* may be taken once a day; a blister may be applied to the sacrum, or perineum; and cold lotions to the hypogastric region.

If success should not speedily attend this treatment, the bladder is to be emptied by means of the catheter. When, however, the contractile power of this viscus is totally lost, the whole of the urine cannot be discharged even through the catheter, more especially if the patient is lying upon his back. In this case, the evacuation must be assisted by pressing the lower part of the abdomen, and making the patient stand up.

The second indication is to restore the contractile power of the bladder; for, as long as this faculty remains unrecovered, the distention and fulness of the viscus recur, and exasperate the complaint. Hence, any large quantity of urine must be prevented from accumulating, by the continued employment of the catheter. This must be introduced several times in the course of twenty-four hours. When the patient, on account of his remoteness, cannot be visited repeatedly, it is better to keep the instrument constantly in the urethra; and in such cases, a flexible elastic gum catheter should always be employed, in preference to one made of silver.

When the catheter is to be left in the passage, it is found most advantageous not to let the urine continually dribble away through the instrument. The writings of Desault inform us, that the bladder is longer in recovering its tone, when constantly relaxed, than when it is allowed to be now flaccid, and now moderately filled with urine.* Hence, it is better either to stop the opening of the catheter, and only allow the urine to be evacuated every two or three hours, or else take the tube out altogether, and introduce it merely when the

* " Ces alternatives d'extension médiocre et de relâchement, font sur ce viscère, ce que fait l'exercice modéré sur les autres parties du corps." *Œuvres Chir. de Desault, par Bichat, tom. iii. p. 126.*

urine is to be discharged. If the instrument is to remain any length of time in the passage it must be withdrawn, and cleansed, about once every six or eight days. As these cases are often tediously long, it is very useful to teach the patient himself to introduce the catheter.

Together with the continued use of this instrument, the above means, calculated to restore the contractile power of the bladder, ought to be employed.

The occasional causes are, also, to be considered. When the loins are injured, topical bleeding, cold lotions to the part, the volatile liniment, blisters, and electricity, may be tried. Retention of urine is very often merely a symptom of another disease, and then the removal of the latter generally leads to a cure.

When the bladder can completely empty itself, the catheter is no longer necessary. But, the surgeon must assure himself by an introduction of the instrument, that this is really the case; for, if any of the urine should be allowed to remain undischarged after each evacuation, the quantity would gradually increase, and a complete retention take place again.

CATHETER.

Some of these are inflexible, being generally composed of silver; while others are both flexible, and elastic. The common inflexible catheter is a silver tube of such a diameter, as will allow it to be introduced with facility into the urethra, and of various figure and length, according as it is intended for the male, or female subject. A common male catheter is ten or eleven inches long. In general, when the urethra is free from obstruction, a large instrument of this kind, like a large bougie, will enter the bladder with more ease than a smaller one, because less likely to be entangled in the lacunæ of the passage. One-third of the catheter, towards its point, should be moderately bent, the curvature being the segment of a circle about six inches in diameter; the other two-thirds, towards its handle, should be straight. The instrument, when gently curved, is found to be more easily introduced, than when it is very much bent. The female catheter is straight, excepting a slight curvature towards its point, and it is about six inches in length.

The ordinary flexible catheter is nothing more than a hollow bougie; and the elastic one, which was invented by M. Bernard, contains in its composition elastic gum. The two last descriptions of catheters have the advantage of being less irritating to the urethra, and less apt to become covered

with calculous incrustations, than silver tubes. In cases of obstruction in the urethra, they can also frequently be got into the bladder, when an inflexible silver catheter will not pass.

Sometimes the instrument is difficult of introduction, owing to a spasmodic affection of the urethra itself, the muscles of the perineum, and the sphincter of the bladder. In this case, before a second attempt is made, a dose of opium may be administered. When inflammation is present, the introduction will often be facilitated by a previous bleeding.

The operation of introducing the catheter may be performed, when the patient is either standing up, sitting, or lying down; but that posture, in which the patient reclines back on a couch or bed, is reckoned the most advantageous.

In performing it, one of the most important maxims is never to force forward the instrument, when it is stopped by any obstacle. If there are no strictures, the stoppage of the catheter is always owing to one of the following circumstances. Its beak may be pushed against the os pubis. This chiefly occurs, when the handle of the instrument is prematurely depressed. Here the employment of force can obviously do no good, and may be the cause of serious mischief. The beak of the catheter may take a wrong direction, and push against the side of the urethra, especially at its membranous part, which it may dilate into a kind of pouch. In this circumstance, if force were exerted, it would certainly lacerate the urethra, and occasion a false passage. The end of the catheter may be entangled in a fold of the lining of the urethra; and here force would be equally wrong. Lastly, the point of the instrument may be stopped by the prostate gland, in which event force can be of no service, and may be productive of great harm. Hence, it is always proper to withdraw the instrument a little, and to push it gently onward in a different position.

As Richter states *, the operation in the male subject may be divided into three stages: in the first, the catheter passes that portion of the urethra which is surrounded by the corpus spongiosum; in the second, it passes the membranous part of the canal, situated between the bulb and the prostate gland; in the third, it enters this gland and the neck of the bladder. In the first stage, little trouble is usually experienced; for, the canal is here so supported by the surrounding corpus spon-

* Richter's Anfangsgr. der Wundarzneykunst, band vi. p. 232, 233. edit. 1802.

giosum, that it cannot easily be pushed into the form of a pouch, in which the end of the instrument can be entangled. The operator need only observe the following circumstance. The penis should be held, by placing the corona glandis between the thumb and the index-finger of the left hand: in this way, the entrance of the urethra will not be at all compressed. The penis is then to be drawn upward, with moderate force. The catheter, being well oiled, is now to be introduced, with its concavity towards the abdomen, into the urethra, directly downward, until its point reaches the bulb. As soon as this occurs, and the beak of the instrument has passed under the arch of the pubes, the surgeon must very slowly bring the handle of the catheter forwards, between the patient's thighs, and in proportion as this is accomplished, the beak of the instrument becomes elevated, and glides into the bladder. In this stage of the operation, the penis must be allowed to sink down, and not to be kept tense, as this would only drag the membranous part of the urethra towards the os pubis, and render the passage of the instrument more difficult. The operation, however, is not always successfully accomplished in this manner. The beak of the catheter may be stopped by the os pubis; it may take a wrong direction, so as to push the membranous part of the urethra to one side or the other; or it may be stopped by a fold of the lining of the passage. The first kind of impediment is best avoided by not depressing the handle of the catheter too soon; that is, before the point has passed beyond the arch of the pubes.

When the membranous part of the urethra is pushed to one side, or the other, the instrument ought to be withdrawn a little, and then pushed gently on in a different direction. When this expedient is unavailing, the index-finger of the left hand may be introduced into the rectum, for the purpose of supporting the membranous part of the urethra, and guiding the extremity of the catheter.

When the prostate gland is enlarged, the urethra generally turns upward very suddenly, just before its approach to the bladder, and of course in this case, the end of the catheter should be more bent upward than the rest of its curvature. According to Desault, a large catheter here usually answers better than a small one, and it may either be of silver or elastic gum. The latter, though the best for the purpose of being kept in the passage, has not always sufficient firmness to get through the obstruction in the canal, not even with the aid of the stilet. In this respect, a silver catheter is sometimes preferable. But, whatever may be the kind of catheter employed, it generally passes as far as the prostate with perfect

facility, where it is stopped, not only by the narrowness, but also by the new curvature of the passage; for, the prostate cannot be enlarged, without pushing forwards and upwards, or to one side, that portion of the urethra, behind which it is situated. This is a circumstance which ought never to be forgotten, in regulating the length and direction of the beak of the catheter, which should be longer, have a more considerable curvature, and be more elevated at the time of its introduction, than in any other cases of obstruction in the urethra.*

In swellings of the prostate gland, Mr. Hey has found, that, by withdrawing the stilet of an elastic gum catheter, the instrument becomes more curved; and he has availed himself of this information, by withdrawing the stilet, as he is introducing the catheter beyond the arch of the pubes, by which artifice, the point of the instrument is elevated in the due direction. This gentleman is in the habit of employing stilets made of brass wire, about one tenth of an inch in thickness.†

When such experiments fail, the surgeon should try catheters of various sizes and curvatures.

In the third stage of the operation, the beak of the instrument has to pass the prostate gland, and neck of the bladder. The chief impediments to its passage in this situation arise from a spasmodic contraction of the neck of the bladder, and from the instrument being pushed against the prostate gland. The first obstacle may be generally obviated by waiting a few moments, and gently rubbing the perineum, before pushing onward the catheter. How the impediment, caused by the prostate, is to be eluded, the reader will understand from what has been already stated. Sometimes the surgeon himself presses the prostate towards the os pubis, by means of the finger in the rectum, and thus prevents the passage of the catheter, by increasing the sudden curvature at this part of the urethra. Hence, as Richter observes, it is a very important maxim, never to introduce the finger so far into the rectum as to press on the prostate gland itself.‡

In cases of enlarged prostate gland, Desault appears to have set the example to the French surgeons, of sometimes forcing a catheter into the bladder: after being tolerably certain (says Bichat) that the end of the catheter corresponds

* *Œuvres Chirurg. de Desault, par Bichat, t. iii. p. 223.*

† *Practical Observations in Surgery, p. 397, 398. edit. 2.*

‡ *Anfangsgr. der Wundarzneykunst, band vi. p. 240.*

exactly to the direction of the urethra, and that the obstacle to its entrance into the bladder only depends upon the narrowness of the canal, we may, without being too fearful of making a false passage, forcibly push forwards the catheter. This instrument, it is asserted, will certainly rather dilate a canal, which already exists, than form a new passage for itself. It was acknowledged by Desault, however, that this plan would be attended with great danger in the hands of young inexperienced surgeons; and that it is only fit to be practised by those, who, combining great experience in the use of the catheter with an accurate knowledge of the different curvatures of the urethra, have at length attained that degree of skill, which never lets them forget for an instant the situation and direction of the beak of the catheter. For (as Bichat states), if, while the instrument is forced on, the beak should be inclined too low, or to one side, &c. a false passage would inevitably be occasioned by a laceration of the membranous portion of the urethra; an accident, which is always of a serious nature, increasing the inflammation of the prostate, and rendering the introduction of the catheter more difficult.* This bold practice, suggested in France by Desault, and adopted by Dease at Dublin, as mentioned in a preceding chapter, is now frequently pursued by Boyer and Roux, and sometimes in this country by M. A. Cooper, Mr. Pearson, &c.† I have also been informed, that Mr. Thomas Blizard, and some other surgeons in London, in cases of diseased prostate, where no instrument can be got into the bladder by gentle means, always force a way through that gland with a conical silver catheter, in preference to puncturing the bladder; and, it is alleged, that the urine has sometimes passed through the new passage seemingly as well as through the natural one. Perhaps, however, where the result has been thus favourable, there was not in reality a new passage, but rather a dilatation of the old track, as mentioned by Desault.

Many eminent surgeons prefer introducing the catheter as far as the perineum, with its convexity towards the abdomen; then keeping the point stationary, they make the handle describe a semicircular movement downwards, so as to bring the concavity of the instrument towards the pubes, as it is situated in the above method. This is the plan which the French surgeons call "*le tour de maître*."

* See *Œuvres Chir. de Desault*, par Bichat, t. iii. p. 224, 225.

† See *Cross's Sketches of the Medical Schools of Paris*, p. 115. 8vo. Lond. 1815.

Elastic flexible catheters may be introduced, either with, or without, a stilet; and their curvature is to be the same as that of the silver catheter. When there was difficulty in introducing an elastic catheter with a stilet, Desault used sometimes to withdraw the wire about an inch, in order to allow the end of the instrument to become more curved; a method somewhat similar to the plan recommended by the late Mr. Hey; but, with the difference, that the latter gentleman withdrew the stilet for the purpose of making the catheter bend more upwards at the moment of its being done, when the beak of the instrument was arrived at the obstruction, over which it was wished to make it ascend.

INFLAMMATORY AND SPASMODIC RETENTION OF URINE.

Inflammation, occasioning this complaint, is frequently situated about the neck of the bladder, in the urethra, or adjacent parts. The difficulty of voiding the urine is to be attributed partly to the spasmodic affection of the urinary passage itself, partly to the action and resistance made by the sphincter and muscles in the perineum, and partly to the swelling arising from the inflammation. When the inflammation, however, is not situated in the urethra and neck of the bladder, but in some neighbouring part, not sufficiently near for its swelling to have the effect of compressing the urethra, the immediate cause of the impediment to the expulsion of the urine must then be referred either to the resistance of the muscles above-mentioned, or the contractile power of the urethra itself.

From these remarks it must be clear, that, in the retention of urine, now under consideration, both antiphlogistic and antispasmodic remedies are principally indicated. It is commonly believed, that a mere inflammation of the neck of the bladder may occasion retention of urine; but, Desault and Richter have remarked, that the complaint is, most probably, generally owing to inflammation in the vicinity; for, inflamed muscles are not prone to contract. In examining the bodies of those subjects who die of enteritis, we find the intestines preternaturally distended, not contracted.*

The inflammation, causing retention of urine, may arise

* "On ne voit jamais un muscle inflammé se contracter, et si on le force d'agir, il ne peut exécuter que de faibles mouvemens. Nous avons aussi remarqué constamment avec ceux, qui ont ouvert des cadavres, que dans les inflammations de bas-ventre; les intestins phlogosés étoient distendus, au lieu d'être rétrécis et resserrés sur eux-mêmes." (*Euvres Chirurg. de Desault*, par Bichat, tom. iii. p. 147, 148.)

from various circumstances; violent fits of the stone; very bad piles; the use of stimulating diuretic medicines, especially the *tinctura lyttæ*; the absorption of powdered *lyttæ* from blisters; bruises of the perineum; fistulæ in ano, &c. But the most frequent exciting cause of the spasmodic, or inflammatory, retention of urine, is the irritation produced by strictures, and virulent gonorrhœa. From this account, it is manifest, that besides taking care to employ antiphlogistic and antispasmodic remedies, it is also necessary to pay attention to each particular cause of the irritation.

The most potent means for relieving the retention of urine, now claiming attention, are copious venesections; the application of leeches to the perineum, or vicinity of the os pubis; the exhibition of opium by the mouth, and in clysters; the warm bath; tobacco* in the form of an enema, and fomentations to the hypogastric region, and perineum. Some also recommend rubbing the latter part with an embrocation, composed of hartshorn, camphor, and *tinctura opii*.

When these measures have been fairly tried, without success, the catheter is to be used; for the continued lodgment of the urine, and the distention, arising from its quantity, may soon cause the paralytic affection of the bladder, already noticed, and even occasion, in the course of three or four days, sloughing, and a fatal extravasation of urine; but if no kind of catheter can be introduced, not even a small one coated with elastic gum, and if the other remedies and artifices spoken of in this chapter, and that on strictures, prove unavailing, it becomes necessary to puncture the bladder, a subject which I shall now proceed to consider.

CHAPTER XXV.

PUNCTURING THE BLADDER.

MANY patients who undergo this operation unquestionably lose their lives; but the frequent ill success in these cases should not be referred to the dangerous nature of the operation itself, so much as to the very diseased state of the urethra, bladder, and kidneys, often existing in such patients,

* See Earle's Cases in Medico-Chir. Trans.

together with great debility, an impaired constitution, and a mass of abscesses and thickened parts, more than enough to account for the unfortunate result. Hence the surgeon who wishes to have greater success, must not let the disease attain so incurable a degree, and, in particular, perform the operation at an earlier period than it is usually done. I think it has been my lot to see several patients lost chiefly in consequence of the puncture not having been made sufficiently soon. We can hardly suppose, that a small wound, made in such parts as are divided in the operation, would often occasion of itself the fatal termination of these cases. It has always appeared to me, that when such means as seem best calculated for promoting the discharge of urine, have failed, after having had a fair trial, the operation of puncturing the bladder becomes immediately as much indicated, as the division of the stricture in cases of strangulated herniæ, when other means have not had the desired effect of liberating the bowels.

Mr. Charles Bell states, that the fifth, sixth, and seventh days, from the commencement of the total obstruction, are those on which the urine may escape from the bladder into the abdomen; and, consequently, he recommends the operation to be performed on the fourth day. *

However, although I am an advocate for not delaying the puncture, after milder methods have decidedly failed, I believe that these methods will almost always prove successful under skilful hands, and that the operation may generally be avoided. In the opinion of Desault, there are very few instances, in which a surgeon, expert at introducing the catheter, cannot introduce the instrument into the bladder, and, consequently, the cases in which paracentesis is absolutely necessary, must be exceedingly unfrequent. This assertion, says Bichat, might be confirmed by a multitude of cases. During ten years, while Desault was principal surgeon of the Hôtel-Dieu, at Paris, whéré diseases of the urinary passages, and, more especially, obstructions in the urethra, are constantly numerous, this distinguished practitioner never had occasion to puncture the bladder, except in one example. This case happened soon after his appointment to the hospital, and, he declared subsequently, that if he had then had as much experience, and had possessed as much skill in introducing the catheter, as he had afterwards acquired, he might, perhaps, have extricated this individual patient from the necessity of submitting to the operation. But, as Bichat observes, since it is not every practitioner

* Operative Surgery, vol. i. p. 515.

that is skilful enough to make the catheter surmount the various obstacles, which may present themselves to its passage, without risk of making a false passage, or doing other considerable mischief; and, since the urethra may sometimes be totally obstructed, so that no catheter, nor bougie, though introduced as far as the stoppage, can serve to give exit to the urine; the operation, in these circumstances, becomes positively indispensable, for the purpose of relieving the urgent symptoms arising from the retention, and preventing the bladder from bursting.*

There are three situations, in either of which the surgeon may make an opening into the bladder, viz. from the perineum, above the os pubis, and through the rectum. Of the first operation I shall say nothing; it is now almost exploded, and, I hope, will soon be entirely rejected from the practice of surgery. Here, however, I wish it to be clearly understood, that I allude to the old method of opening the bladder, with a trocar, between the neck of that viscus and the insertion of the ureters; for I am of opinion with a modern writer, that cases frequently present themselves, in which the plan of letting out the urine by an incision practised in the perineum, is much more advisable, than either puncturing the bladder from the rectum, or from above the pubes. But, then, the operation I here allude to is not a hazardous thrust of a trocar at a point between the neck of the bladder and the insertion of the ureter, a point which can never be hit with certainty; but, a simple incision into the dilated membranous portion of the urethra. "If," says Mr. C. Bell, "a man have a stricture in the urethra, and the surrounding parts be indurated, so that there is no immediate hope of removing it by the caustic, or the bougie; if, with this, there have occurred a sudden obstruction, and the bladder has risen and has lost its action, and there remains no expectation of spontaneous relief, or of ease from lesser remedies, then I apprehend it is better to open the urethra in the perineum behind the stricture. And, (says Mr. Bell,) this is to be immediately done, if the symptoms indicate a rupture of the urethra, and effusion of urine."†

OF THE PUNCTURE ABOVE THE PUBES.

Some writers have advised the surgeon to make a perpendicular incision, about an inch and a half or two inches in

* *Œuvres Chirurg. de Desault par Bichat*, tom. iii. p. 316.

† *Surgical Observations*, vol. ii. p. 61. 8vo. Lond. 1818.

length, through the integuments and fat, covering the lower part of the linea alba. When this plan is followed, the wound ought not to be made, as certain authors direct, with its lowest part full an inch above the os pubis. There is no real reason for avoiding this bone, and, the lower the incision of the above extent is made, the nearer it is to that part of the bladder, which it is most advisable to puncture, and the further it is from the peritoneum. Hence, the bottom of the incision should just meet the upper part of the above bone. A cut of the same length is next to be made between the pyramidal muscles, and, this being done, the surgeon can feel with his finger the prominent, distended bladder. A trocar, the curvature of which forms a segment of a circle seven inches in diameter, is now to be introduced into the exposed part of this viscus. When this instrument is held with its convexity upward, that is, towards the patient's navel, it can be more conveniently introduced obliquely downward, and backward into the bladder, in the direction of the axis of this receptacle, than any straight trocar can possibly be. As M. Sabatier observes, a curved instrument of this kind is much less likely to penetrate the back part of the bladder, and wound the rectum; besides, having this advantage, that, when the urine is evacuated, and the viscus collapsed, the cannula will not be so apt, as that of a straight trocar, to be separated from the part in which it has been introduced.* Here we may discern another reason for making the puncture immediately above the symphysis of the pubes, and not an inch or two higher up, as Sharp and B. Bell have recommended: the bladder, which rises up between the peritoneum and recti muscles, descends again, when the urine is discharged, and, consequently, must be more liable to slip away from the cannula, the higher the puncture has been made.†

Many operators make no preliminary division of the integuments and fat, but introduce the trocar at once into the bladder; which method, I should always select myself, where

* See *De la Médecine Opératoire*, tom. ii. p. 128, 129.

† Richerand, *Nosographie Chirurgicale*, tom. iii. p. 499. By the employment of a long trocar, of course the objection here specified might be got rid of; but, the cannula of such an instrument has sometimes pressed against the opposite side of the bladder, and caused there an ulcerated opening. If the patient be not very fat, Flurant's curved trocar, about five inches long, is an eligible instrument for the operation; the cannula of a shorter one is liable to slip out of the bladder, and make a repetition of the puncture necessary, as happened in the practice of Professor Schreger. See his *Chirurgische Versuche*, b. i. p. 212. Nurnberg, 1811.

the patient is not extremely corpulent, and the swelling formed by the distended bladder is perfectly evident and distinct.

When the operator perceives, by the want of resistance, that the point of the instrument is in the bladder, he is to take hold of the mouth of the cannula, and while he pushes this further into the viscus, he is to withdraw the stilet. After the urine is discharged, the cannula is to be left in the wound; its mouth is to be stopped up with a linen tent, and it is to be kept from slipping out, by means of tapes, passed through the two little rings at the sides of the instrument.

Some surgeons are in the habit of passing an elastic gum catheter into the bladder through the cannula, and then taking the latter away. It does not appear to me, that any utility or advantage is likely to accrue from this method. An elastic gum catheter does not exactly fill the wound; consequently, the urine is discharged, not only through its cavity, but also between the track of the wound and the circumference of the instrument, so that the chance of the urine becoming diffused into the cellular membrane is not guarded against, as it is by allowing the cannula to remain in the wound, at least, two or three days, until inflammation has agglutinated together the surrounding cellular substance, and removed the possibility of such an extravasation. In some examples upon record, the cannula, after having been kept a few days in the wound, was taken out, and readily introduced again, as occasion required. *

Still, I do not feel authorized to recommend this mode of proceeding; not because there would be much risk of effusion of urine; but because it has happened, that the tube could not be replaced, and the urine became confined again, so that a repetition of the operation would have been absolutely necessary a third time, had not Schreger succeeded in procuring an evacuation through the urethra, by distending this canal with warm water, injected with some force into the passage by means of a syringe, and a cannula introduced as far as the stricture would allow. †

One objection to introducing an elastic gum catheter into the

* See Bohn über Harnverhaltung und Blasenstich, Leipzig, 1794; Noel in Desault's *Journal de Chirurgie*, tom. ii.; Turner, in *London Med. Journal*, vol. xi.; *Journal de Médecine*, tom. lxxxiii.

† *Versuche Chirurgische*, b. i. p. 216. 8vo. Nurnberg, 1811. In cases of retention of urine, from calculi lodging near the neck of the bladder, Schreger employed the same artifice with success. It is this principle of distending the urethra with fluid, that has been so strongly recommended by Mr. Arnott in various affections of that canal; a subject to which I have adverted in a previous chapter.

wound, is the length of such an instrument, the end of which would produce great irritation in the bladder. The use of long, straight, silver cannulæ, has been known to form a communication between the bladder and rectum, in consequence of ulceration, or sloughing, produced by the pressure of the points of these instruments on the back part of the bladder. Mr. Samuel Sharp mentions his having seen this accident *, and a modern author informs us, that, in a case where a common trocar was used, he dissected the parts; "the bladder fell on the sharp edge of the trocar, this produced inflammation of the bladder and peritoneum, which occasioned the death of the patient."†

However, it is obvious, that the exit, made for the urine in the above operation, is merely designed as a temporary one, and that, as soon as the impediment to the passage of the water through the urethra is removed, the wound ought to be allowed to heal.

Whenever the prostate gland is known to be very much enlarged, one would certainly prefer this mode of operating to puncturing the bladder through the rectum. This operation has the advantage of being done generally at a distance from the diseased parts, and without risk of injuring any parts of importance. The chance of an extravasation of the urine ensuing is not great, though possible. It is even conceived by a modern writer, that the chance of an effusion of urine should never be mentioned as an argument against this mode of puncturing the bladder, because when the cannula happens to slip out of the puncture, the little wound becomes impervious. In fact, this does appear to have been exemplified in the instance recited by Schreger, where the tube slipped out twice; viz. on the evening of the day on which the bladder was first tapped; and again on the third night from the second performance of the operation; for, after each displacement of the cannula, no probe could be passed into the bladder, no urine escaped, and that receptacle became enormously distended again. In other cases however, to which I have already referred, this closure of the puncture immediately after the displacement of the cannula did not happen; it did not occur in an example related by Schreger himself, in which he took out the cannula of the trocar on the thirteenth day,

* See a Critical Inquiry into the present State of Surgery, p. 127. edit. 4.

† See A History of the High Operation for the Stone by Incision above the Pubes, and an account of the various methods of Lithotomy, by J.C. Carpue, p. 176. 8vo. Lond. 1819.

and put in another *; and it is therefore not to be regarded by any means as an invariable and direct consequence of the tube slipping out of its place. The displacement of the cannula †, the possibility of not being able to get in another tube, and of an extravasation of urine, I should think, therefore, ought still to be considered amongst the objections to this method of operating. Another disadvantage is, that the opening is not made in a depending situation, and consequently the whole of the urine cannot be readily and conveniently discharged. I have more than once seen this operation attempted, without the trocar reaching the bladder, or any urine being voided; and Mr. Carpué speaks of a case, in which the instrument, on going into the bladder, had pushed this viscus from its slight connection with the pubes. ‡

Though I have deemed it my duty to specify impartially the various inconveniences to which this method of puncturing the bladder is liable, I think it ought to be preferred, when the prostate is enlarged, or any disease about the rectum makes the plan, which I shall presently describe, unadvisable.

OF THE PUNCTURE THROUGH THE RECTUM.

The patient is to be put in the posture, which will be recommended for lithotomy. An assistant is to make pressure on the abdomen, just above the os pubis, in order to make the prominence of the bladder more distinct to the surgeon's finger in the rectum. A curved trocar, with its point drawn within the cannula, is to be introduced with the right hand, and conveyed, upon the index-finger of the left, along the swelling, formed by the distended bladder. The instrument should be kept exactly in the central line of the front portion of the rectum, and, when conveyed sufficiently beyond the prostate gland, the point of the trocar is to be pushed into the bladder, through the anterior part of the intestine.

This operation is so easy of accomplishment, and so very safe, that it certainly merits a general preference. The coats of the rectum and bladder, at this part, are in immediate contact, and the instrument has to penetrate no thickness of substance. The operation is not more painful than venesection, and the distended bladder is so distinctly perceptible to the

* Versuche Chir. b. i. p. 225.

† "L'attention la plus essentielle à avoir est de fixer la cannule de manière qu'elle ne se déplace point." Lassus, Médecine Opératoire, t. i. p. 297.

‡ A History of the High Operation, &c. p. 177.

finger, that no mistake can well be made. The only chance of doing mischief arises from the situation of the vesiculæ seminales; but, all risk is removed, when the trocar and the finger are introduced sufficiently into the rectum, and the puncture is made exactly in the central part of the swelling. The curved trocar, formerly recommended by Flurant, and about five inches long, is the most proper for this operation.

In the last edition of this book, the directions which I gave for puncturing the bladder from the rectum, have appeared to Mr. Carpue objectionable, inasmuch as the space beyond the prostate, where the puncture can be made, without any risk of wounding the peritoneum, is very short.* When first I heard of this criticism I thought it of value, and my mind was quite open to conviction, as the only real wish ever entertained by me is to give such views of the practice of surgery as may be most beneficial to the afflicted. As soon as I heard of Mr. Carpue's observation, however, it seemed to me rather extraordinary, that, though the operation had usually been done by surgeons very much in the way explained in my book, and perhaps without due attention to the very short space naturally left between the prostate, and the cul-de-sac of the peritoneum, yet, I had never in the course of my reading met with any notice of the peritoneum having been thus injured. Future reflections have now persuaded me, that, just and accurate as Mr. Carpue's statement is, with respect to the anatomy of the parts in the healthy state, it is far from being so in regard to the same parts, in retentions of urine. In these cases, as Desault has correctly pointed out, the bladder spreads more from below upwards, than in any other direction. Its inferior portion becomes broader and more deeply situated, pushing the perineum downwards and forwards, and the rectum backwards. The posterior part of the bladder, which is covered by the peritoneum, lifts the mass of small intestines upwards and backwards, and rises into the cavity of the belly.† When these changes are considered, together with the universal expansion of the bladder in its distended state, we shall immediately see, that the lowest point of the peritoneum, where this membrane is reflected from the posterior part of the bladder to the rectum, must become considerably displaced in the direction upwards and backwards, and a much larger space be left for the safe introduction of the

* A History of the High Operation for the Stone, &c. by J. C. Carpue, p. 178—180.

† Œuvres Chir. de Desault par Bichat, t. iii. p. 113.

trocar, than would present itself in the natural state of the parts. I offer these remarks, however, only in explanation of what I had some difficulty in making out when I first heard of Mr. Carpue's observation, due attention to which I still consider highly necessary.

The only inconvenience following the operation, is the necessity of keeping the cannula introduced, until the urine resumes its natural course. This circumstance is not only very troublesome, when the patient walks or sits; but is particularly so, at the time when he goes to stool. The trouble, attendant on the evacuation of hardened feces, may always be diminished by injecting a clyster; and whenever the patient has a motion, he should hold the cannula with his fingers, in order to prevent its protrusion.

Although I should not advise the practice, perhaps no harm would generally result from withdrawing the cannula, after puncturing the bladder through the rectum. I conceive that the frequent passage of urine through the wound, would mostly be sufficient to keep it from closing, and the occasional passage of this fluid through the lower part of the rectum, might not be so irritating and troublesome, as the continual presence of the cannula. There is upon record*, an instance, in which the cannula was inadvertently withdrawn forty-eight hours after the operation, and could not be introduced again. The urine was discharged through the rectum six days; and as soon as it began to flow through the urethra, the wound healed, without leaving any fistulous communication between the bladder and the intestine. Richter states, that the cannula has even been withdrawn immediately after the operation, without any inconveniences following the occurrence.† A case, however, is mentioned by a modern surgeon, in which the cannula slipped from the wound on the seventh day, and as the bladder became distended again, a second puncture was considered necessary, and performed with success.‡ The safest practice, therefore, is that of keeping the tube in the puncture, until the impediment to the patient's making water in the natural way is removed.

The operation of puncturing from the rectum is not eligible, when the prostate gland is very much enlarged; when there are large hemorrhoids present; or when the rectum is, what is termed, scirrhus-contracted.

* Bently in *Medical Communications*, vol. i.

† Richter's *Anfangsgrunde der Wundarzneykunst*, band vi. p. 328. edit. 1402.

‡ Carpue on the High Operation, &c. p. 178.

To women it is obviously inapplicable, for anatomical reasons. In female patients, however, it is very practicable to puncture the bladder from the vagina; though in them, the urethra is so capacious and short, that the surgeon is hardly ever under the necessity of puncturing the bladder at all, as the catheter may almost always be introduced. If necessary, however, the operation may be done either above the os pubis, or through the vagina. *

CHAPTER XXVI.

INCONTINENCE OF URINE.

AN inability to retain the urine in the bladder is of three kinds: in one, the water continually dribbles away, without any inclination to void it, or any sensation of its being voided. In other instances, the patient can hold his urine in a certain degree; but, the propensity to evacuate it comes on so frequently, suddenly, and irresistibly, that he is compelled to discharge it. The third kind of incontinence only occurs during night, when the patient is asleep.

The first species of incontinence of urine depends on a weakness, or total paralysis, of the sphincter muscle of the bladder. As the neck of this organ is constantly open, every drop of urine escapes into the urethra, immediately it has descended from the ureters, and does not lodge in the bladder at all. Sometimes the weakness, or paralysis, of the sphincter muscle is quite a local disorder; but, most frequently, it is only symptomatic of some other affection. In the first case, it is often the consequence of a difficult labour, in which the neck of the bladder has been a long while compressed; or of the distention, caused by a stone lodged at this part of the viscus. Sometimes, incontinence of urine depends on a malformation of the urinary passages, and exists from the time of birth. The complaint is often only an effect of apoplexy, injuries and diseases of the spine, &c.

It is not dangerous, though exceedingly annoying, in consequence of its continually wetting the clothes, causing a dis-

* Retroversi uteri is almost the only case, in which it may become absolutely necessary to puncture the female bladder.

agreeable smell, and even excoriating the parts, over which the urine flows.

When the complaint is local, tonics and astringents are indicated; and the principal remedies are, cold bathing, bark, blistering the sacrum or perineum, the internal exhibition of the tinctura lyttæ, the shower-bath, electricity, and rubbing the spine and sacrum with stimulating liniments.

When the incontinence of urine is merely an effect of another disorder, the latter claims the principal attention.

The second species of incontinence of urine is of a spasmodic nature, and commonly depends on some irritation operating on the bladder. Hence, the indication is to find out the irritation, and, if possible, to remove it. Hemorrhoidal complaints, suppressed menses, a stone in the bladder, a fistula in ano, &c. may cause the affection. When the particular irritation cannot be discovered, general soothing and antispasmodic remedies, such as opium, the warm bath, fomentations, &c. should be prescribed. The uva ursi is said to be very useful in these cases: a scruple, or half a drachm, of the powder may be given, three times a day.

This kind of incontinence of urine is frequently only a symptom of epilepsy, or hysteria. Sometimes, it originates from pressure being made upon the bladder; and hence, it may be a symptom of polypi of the uterus, a prolapsus of this viscus, or difficult parturition.*

The last sort of case to be mentioned, is that, in which the urine is involuntarily discharged in the night-time, when the patient is asleep. The infirmity is mostly met with in young boys and girls; and, for the most part, spontaneously goes off as they approach the adult state. Such subjects as are troubled in this manner, should avoid drinking any fluid just before going to bed, and should be particularly careful to empty the bladder before they go to sleep.

When the infirmity afflicts adult persons, and does not yield to the above precautions, one-fourth of a grain of the powder of cantharides, given with milk of almonds, every evening, has

* The retention of urine, from paralysis of the bladder, is a case attended with an involuntary dribbling away of this fluid, if the catheter be not properly employed, and is a disorder, that has frequently been mistaken for that opposite malady, an incontinence of urine. As soon as the bladder is distended to a certain degree, the urethra being unobstructed, the continued secretion from the kidneys, instead of causing the bladder to give way, passes off through the natural channel. The discharge of urine leads the unwary surgeon never to suspect the real nature of the disease; but, if a catheter chance to be introduced, the quantity of urine drawn off immediately throws light upon the true character of the disorder.

been known to be of service. If this medicine should be ineffectual, the practitioner may try the effect of exhibiting a grain of opium, or two grains of ipecacuanha, every night, a little before bed-time.

In this treatise I have not thought it necessary to describe any particular apparatus for catching the urine, in cases where no cure can be accomplished.

There is a particular incontinence of urine, arising from the formation of a preternatural communication between the bladder and vagina. It is usually the consequence of a slough, and sometimes follows difficult labours. The continual dribbling of the urine, through the opening, generally prevents it from healing; but, by making the patient lie a good deal on her abdomen, the water is hindered from constantly escaping, and the aperture will sometimes heal.

Attempts have been made to close the preternatural opening, by scarifying its edges, and keeping them afterwards in reciprocal contact, for a certain time, by means of a twisted suture. If such an operation were found to be practicable, it would be proper to make the patient lie on her abdomen, as much as possible, during the space of two or three days, that is, till the suture were removed.

CHAPTER XXVII.

IMPERFORATE VAGINA.

IN cases of this description, the vagina is commonly found shut up by a membrane, which is, in fact, the hymen, without any aperture in its centre. In new-born infants, this membrane sometimes extends so far forward, that it covers the orifice of the meatus urinarius, and prevents the evacuation of the urine.

When the membrane is situated behind the meatus urinarius, no inconvenience is perceived until the period, when the menstrual discharge commences. As this evacuation cannot escape externally, it accumulates in the vagina, so as to occasion several local and general complaints, which lead to an examination of the parts, and to the detection of the malformation. Pain in the loins; a sense of heaviness and tension in the uterus; hardness of the abdomen; frequent propensity to make water, and even a retention of urine; pain in going to

stool, &c. are the inconveniences usually resulting from the imperforate vagina. The patient is also observed to have no evacuation from the uterus, at the age, when it naturally ought to take place.

At first, these complaints are only experienced once every month; but, when a large accumulation of blood has occurred, they continually afflict the patient. At length, giddiness, paleness, swelling of the belly, drowsiness, and efforts, like those of labour, exasperate the state of the case.

The nature of the disorder may easily be detected by an ocular examination. Careless practitioners, however, are apt to fall into error, and suppose, that all the above complaints originate from chlorosis, or pregnancy.

The operation for the relief of this case is very simple. The surgeon is to divide the membrane by a longitudinal incision, made from the place just below the meatus urinarius downward. After the accumulated fluid has been evacuated, the edges of the divided membrane are to be kept asunder for two or three days, by means of a dossil of lint. If the dark, thick discharge does not easily escape, warm water must be injected, to promote the evacuation.

Although the operation has been performed with entire success, and several pints of blood have been discharged, three or four years after the commencement of the disease, yet, it ought to be known, that a considerable delay is always attended with two dangers. In the first place, when the blood accumulates in such quantity, that the vagina cannot contain it all, the uterus next becomes distended, and this fluid may escape through the Fallopian tubes, and be extravasated in the abdomen.* Secondly, when the menstrual evacuation has been a long while prevented from taking place in the natural way, in consequence of obstruction in the vagina, it may never admit of being re-established, notwithstanding the mechanical impediment be now removed. It is asserted, that, in one example of this sort, the menstrual discharge continued to be determined to the lungs and kidneys, although the obstacle to the evacuation being made in the natural way had been obviated by a surgical operation.†

Sometimes, the vagina is closed, not by a membrane, but by a concretion of the opposite surfaces of the labia, nymphæ, and mouth of the vagina. No opening is discernible, except a small one, from which the urine flows. At the same time,

* See De Haen's *Ratio Medendi*, pars sexta.

† Bresslauer *Sammlungen*, 1757.

there is always to be seen a white raphe, or line, extending from the aperture directly downward, and easily distinguished from the other parts by its firmness and whiteness. This case is sometimes an original malformation; but, in other instances, it results from neglecting to keep the parts asunder, when in an excoriated state.

When a director can be introduced through the above opening into the vagina, the surgeon is to imitate Saviard, and pass a straight narrow bistoury along the groove of the instrument, and then make a division of the parts, in the direction of the above mentioned raphe. * When the director cannot be introduced, the surgeon must use the knife cautiously, taking care not to wound the rectum, or bladder.

When only the nymphæ are adherent together, the separation is very easily accomplished.

The divided surfaces are always to be kept asunder, by means of lint, or pieces of sponge, until the parts are completely cicatrized.

Sometimes, in consequence of a congenital malformation, the opening of the vagina is closed by a fleshy mass. In one instance, the tumour seemed to grow from the inner surface of the labia, having, just below the clitoris, a small aperture, out of which the urine escaped. A probe, which was introduced, passed into the bladder, but could not be made to enter the vagina. An incision, however, being made through the middle of the fleshy mass, the vagina was opened. The portion of the tumour on each side was cut away, without any hemorrhage of importance, and a cure followed. †

In particular cases, the vagina is imperforate at a part more or less distant from its external orifice. The closure may be owing to adhesions, that have arisen from inflammation of the passage, after a difficult labour, or some other cause. They can only be detected by manual examination, and, with regard to the treatment, surgical writers recommend us to divide them with a pair of blunt-pointed scissors. ‡

In certain instances, a preternatural membrane, more or less deeply situated, entirely shuts up the passage. The further such membrane lies inwards, the more difficult are its detection, and the operation. Both, however, are facilitated by the menstrual discharge, which accumulates behind the membrane, urges it forwards, and makes it tense. When the vagina is

* See Saviard's *Obs. Chirurgicales*, obs. 32.

† Donauld, in *Journal de Médecine*, tom. xxxvii.

‡ Richter's *Anfangsgr. der Wundarzneykunst*, band vi. p. 368.

thus imperforate at a distance from its external orifice, the menses may accumulate in the uterus, and not only distend this organ, but also the Fallopian tubes, and be extravasated in the abdomen, producing fatal consequences. These tubes have even been found lacerated.*

When the preternatural membrane does not altogether close the vagina, and is deeply situated, it may never be detected; for, it does not prevent the evacuation of the menses, nor the act of copulation. But, if it be firm and indurated, it may prove a hinderance to parturition, or else lead to a dangerous laceration of the parts, unless a timely division of it be made, as the observations of those eminent writers, Ruysch, and J. L. Petit, confirm.†

Occasionally, the sides of the vagina itself become adherent to each other, or the canal is rendered imperforate, by the effects arising from ulceration and sloughing in the passage, the contraction of cicatrices, &c. Such mischief may be produced by difficult labours, or other causes. Examples are recorded, in which the vagina was closed to a considerable extent, and, yet, a cure was accomplished by dividing the obstruction. The following case is, in many respects, interesting. A young woman, twenty years of age, was affected with a hard swelling in the abdomen, below the navel, and with another smaller one, of the size of a hen's egg, situated on the left side. There also existed a preternatural formation of the parts of generation. Instead of the vagina, only a fissure, about half an inch long, was observable, into which the point of the finger could be introduced. The bottom of this slit was entirely closed, and had a hard firm feel. The patient experienced a sense of pressure and weight about the pelvis, and back, and pain in the hips; she lost her appetite, had a short respiration, and an accelerated pulse. She was also costive, and troubled with frequent inclination to make water; but could only discharge it by drops, and with much pain. These symptoms sometimes became milder; sometimes, more severe. When they were violent, the abdominal swellings, which were regarded as being situated in the uterus and ovary, constantly acquired an increase of size. The bottom of the fissure was punctured with a lancet, and on the incision being carried to the depth of two inches, the retained menses began to be discharged, which were thick, and void of all bad smell.

* De Haen's *Ratio Medendi*, pars sexta; and Sabatier's *Médecine Opératoire*, tom. i. p. 365.

† See *Observationum anatomico-chirurgicarum centuria*. Amstelod, 1691, in 4to; and *Traité des Maladies Chirurg.* tom. iii. p. 110.

After about four pints had issued, the evacuation spontaneously ceased. The swellings in the abdomen had now diminished, though they had not entirely disappeared. As the patient, the day after the operation, was feverish, suffered a good deal of pain in the back, and her belly swelled, an emetic was administered. This excited a large evacuation of more bloody fluid, whereupon all the bad symptoms, and the tumour in the abdomen, completely subsided.*

In some unusual examples, the os tincæ itself is imperforate, either in consequence of congenital malformation†, or of an obliteration of it by disease. When the opening is merely closed by a membrane, the menses themselves, after accumulating in a certain quantity, burst the unnatural obstruction, and effect a permanent cure.‡ Should this not happen, relief may be obtained by simply making a puncture with a curved trocar. When, however, the mouth of the womb is totally obliterated, an operation is a more hazardous proceeding. The attempt, indeed, has been known to be followed by violent inflammation and death.§ Yet, in some other instances, it has proved successful.|| After the operation, injections must be employed, and an elastic catheter may be introduced, as well for this purpose, as for that of keeping the new opening pervious. In fact, in one case, the aperture closed, and a second operation was necessary.¶

CHAPTER XXVIII.

IMPERFORATE ANUS.

OF this case there are three varieties. In the first, the anus is either closed by a membrane, or it is too contracted to allow the feces to be easily evacuated. In the second, the anus appears to be properly formed, and the finger, or probe, may be introduced into the cavity of the rectum, for some way; but,

* See Duncan's Medical Commentaries, vol. ix.

† Hemman's Versuche and Journ. de Médecine, tom. lxxv.

‡ Block's Bemerkungen.

§ Matthieu in Hist. de la Société Royale de Médecine, ann. 1777, 1778.

¶ Hemman.

¶ See Richter's Anfangsgr. der Wundarzneykunst, band vi. kap. 18.; and Hemman's Versuche.

the bowel terminates in a *cul-de-sac* above the anus. In the third kind of case, there is no vestige whatever of the anus.

With such malformations, we may arrange cases, in which the rectum opens into the bladder, urethra, or vagina. When such a circumstance occurs in female children, they may possibly live, in consequence of the great dilatation of which their urethra is susceptible, and the vagina being a sufficiently capacious passage for the exit of the feces. Male children, on the contrary, must inevitably perish.

The first kind of imperforation is easily distinguishable. The child does not discharge the meconium; he makes great efforts, which are at last attended with convulsions. A membrane, of rather a transparent nature, is visible in the situation of the anus, and through it, the colour of the meconium may be seen. In consequence of the continual efforts, which the infant makes, the membrane becomes more and more protruded, so as to form a tumour. When there is a very small opening, the fluid part of the meconium escapes; the child makes less considerable efforts; but, these are sufficient to excite alarm. The defect is readily detected by an examination.

If the anus should be closed by a membrane, this may have a crucial incision made in it, and, if necessary, the angles may then be removed. The frequent evacuation of the intestinal matter will be quite sufficient to keep the opening pervious.

When there is an aperture at the anus, but it is too narrow, it must be dilated, in the most convenient direction, by means of a crooked bistoury and a director. This case is not so simple as the former one; for, the extremity of the rectum may be contracted, as well as the integuments. In this circumstance, the edges of the wound will be very prone to contract again, if not kept mechanically dilated, until a complete cicatrization has taken place. The whole of the sphincter ani may also be cut, and an inability to retain the feces be the irremediable consequence.

The second species of imperforate anus is highly dangerous, on many accounts; but, particularly, because very liable to be a long time unnoticed, by reason of the external appearance of the parts being natural. The impediment to the passage of the excrement may be ascertained by introducing the little finger into the rectum, or, when this is impracticable, by using a probe. If the obstruction is near the end of the rectum, a division of it may be made with a narrow knife. M. Sabatier recommends cutting from the sacrum, towards the

scrotum, or pudenda. * Any stoppage, situated far up the intestine, can only be removed by puncturing it with a trocar, introduced through a cannula. The instrument should have a curve, corresponding to the semilunar form of the rectum. This operation is performed, as it were, in the dark, and is, by no means, a pleasant one to undertake.

The third kind of imperforate anus, presents nothing externally, by which the situation of the end of the intestine is indicated. This part may be so remote, that it would be impossible to find it by any practicable method. How can cutting instruments be employed in so deep a situation? If the operator were to succeed in procuring an exit for the meconium, through what a thickness of parts would it not have to pass? The light of anatomy, as M. Sabatier observes, would here be invoked in vain. Almost all infants have died soon after an operation for this sort of imperforation, even though the rectum had been found and opened.

In these cases it has been proposed by Littre to cut into the abdomen above the left groin, and to endeavour to establish an artificial anus, by opening the colon in this situation. Such an operation, indeed, seems to have been practised with success by a French surgeon, named Duret. †

A very curious example is recorded, in which the end of the rectum was closed, but a sort of appendix proceeded from it over the prostate gland, between the erectores penis and acceleratores urinæ muscles, passed along under the urethra, and terminated in a small opening near the frænum. The child was saved by an incision made into the rectum, in the natural situation of the anus. ‡

One would suppose, that an imperforate anus, that does not admit of being remedied, must unavoidably prove quickly fatal. Yet, if credit is to be attached to certain cases on record, children may live several months §, and even years ||, with an imperforate anus, the excrement, during such time, being ejected by vomiting, as often as occasion requires. For my own part, I am inclined to judge of the veracity of these instances, by considering, according to the maxim of

* Médecine Opératoire, tom. i. p. 353.

† Sabatier, Médecine Opératoire, tom. i. p. 355.

‡ Flajani, Collezione d'Osservazioni e Riflessioni di Chirurgia, tom. i. p. 18. Roma, anno 6.

§ Journal de Médecine, ann. 1770, p. 510.

|| Lib. cit. tom viii. p. 60.

Hume, which would be the greatest miracle, the truth of these marvellous assertions, or the falsity of the evidence by which they are supported.

CHAPTER XXIX.

FISTULA IN ANO.

THIS term is applied to every abscess in the vicinity of the anus; but very improperly; for, the idea of there being a fistula naturally leads to the adoption of measures totally different from those which are applicable to common abscesses.

Sometimes, the complaint makes its attack, in the form of phlegmonous inflammation, attended with sympathetic fever. A part of the buttock near the anus is considerably swollen, and has a large circumscribed hardness. The middle of this hardness soon becomes very red, and matter forms in its centre. As Mr. Pott remarks, the pain is sometimes great, the fever high, the tumour large, and exquisitely tender; but, however high the symptoms may have risen before suppuration, yet, when that end is fairly and fully accomplished, the patient generally becomes easy, and free from fever. The matter, though plentiful, is good.

On other occasions, the fistula in ano begins as an erysipelatous inflammation, without any of the circumscribed hardness which characterizes the preceding tumour. The affection, on the contrary, spreads more extensively; the disease is more superficial; the quantity of matter small, and the cellular membrane sloughy to a considerable extent.

Sometimes, the complaint begins somewhat like a carbuncle. The skin is of a dusky red, or purple kind of colour, and, although harder than in the natural state, yet it is not nearly so tense as in phlegmonous, or erysipelatous inflammation.

At first, the pulse is full and hard; but, if no relief be obtained, it soon becomes unequal, low, and faltering; and the strength and spirits are greatly dejected. The matter formed under the skin is small in quantity, and bad in quality, and the cellular membrane is in a sloughy state. This species of the disease affects persons, whose habit, as Mr.

Pott remarks *, is either naturally bad, or has been rendered so by intemperance.

These different affections often influence parts in the neighbourhood of the disease. Hence, retention of urine, strangury, prolapsus ani, tenesmus, piles, diarrhoea, or obstinate costiveness, are frequently added to the above-described mischief.

Sometimes the fistula in ano, first appears as an induration of the skin near the anus; but without pain, and alteration of colour; which hardness gradually softens and suppurates.

The matter may either point in the buttock, at a distance from the anus; or near this latter part; or in the perineum. The matter may escape from one opening, or from several. Sometimes, there is not only an external aperture, but another internal one communicating with the cavity of the intestine. In other instances, there is only one external, or internal opening.

The matter may be formed at a considerable distance from the rectum, which is not even laid bare by it; in other cases it is laid bare, but not perforated; sometimes it is both denuded, and pierced.

TREATMENT.

These inflammations can scarcely be prevented from suppurating. Hence, the indications are, to moderate the symptoms, to promote the formation of matter, and, when this has collected, to let it out, and treat the sore, in such a manner, as shall be most likely to produce a speedy cure.

A soft poultice is the best application for promoting suppuration. When the inflammation is phlegmonous, the thinner the skin is suffered to become, before the abscess is opened, the better. If the patient be of a full, sanguine habit, venesection, and mild purgatives, are proper.

When the attack is of an erysipelatous kind, and there is a sloughy state of the cellular membrane, the sooner it is opened the better. As Mr. Pott observes, if we wait for the matter to point, we shall wait for what will not happen, at least not till after a considerable length of time, during which the disease in the membrane will extend itself, and, consequently, the cavity of the sinus, or abscess, be thereby greatly increased.

When the fistula in ano commences with that kind of

* Treatise on the Fistula in Ano, Chirurg. Works, vol. iii.

inflammation which a carbuncle exhibits, no evacuations are necessary. The part should be opened early by a very free incision.

In opening all abscesses about the anus, the incision should be so large as to divide the whole of the skin covering the matter. Thus the abscess will be discharged at once; future lodgment of matter will be prevented; and convenient room will be made for the application of proper dressings.

All fistulæ in ano do not necessarily interest the rectum; sometimes the matter is so distant from the intestine, that the surgeon has no more to do with this part, than if it did not exist, and the abscess is to be treated upon general principles.

The idea of callosity, naturally attached to the term fistula, is the great cause, why former surgeons were in the habit of distending abscesses, about the anus, with escharotics, and why they even sometimes cut away considerable portions of flesh. It is true, there is hardness generally surrounding fistulæ in ano; but, this is only such as accompanies every other description of abscess.

The dressings, applied to the cavities of these collections of matter, ought to be so small in quantity, as to allow nature to approximate the sides of the cavity together, and they should be quite unirritating.

By such simple treatment, the necessity of meddling with the rectum will often be removed. But, it more frequently happens, that the intestine, although not pierced by the matter, has yet been so denuded, that the sinus will not heal, without laying the cavity of the abscess, and that of the intestine, into one.

The operation consists in dividing the rectum, from the top of the hollow, in which the matter is lodged, as far as the anus. Thus the sinus is converted into an open wound. A narrow, curved, probe-pointed knife, is the proper instrument, and if it can be guided by the director, introduced through the track of the fistula, quite as far as the intestine, so much the better. The surgeon's fore-finger in the rectum will here feel the point of the knife. Then the director, if used, is to be withdrawn, and the operation is to be completed, by bringing the knife out, with its point applied to the finger, which was in the intestine. In this manner, all that is between the edge of the knife and the anus, must obviously be divided.

Immediately after the operation, a soft dossil of fine lint should be introduced, from the rectum, between the lips of the incision. This first dressing should remain, till loosened

by suppuration. All the future dressings should be light, soft, and unirritating. The hardness and swelling, following the operation, must not be regarded as a diseased callosity, or lead the surgeon to use pernicious escharotic applications. A T bandage is usually employed.

We have now to consider *fistulæ* in ano, in the state in which they are after having spontaneously burst.

When the matter has only made its escape through external openings, these are termed *blind external fistulæ*. When the matter has only an opening in the intestine, and none in the skin, the fistula is called a *blind internal fistula*. *Fistulæ*, having an opening, both in the skin, and gut, are termed *complete*. The first and last kind of case is the most common. A probe is to be introduced to ascertain the nature of the case, and the operation, already described, is the proper one for obtaining a cure. When there are several openings, and corresponding sinuses, they are all to be divided so as to make one cavity of the whole. This can be most conveniently done with a curved knife.

In cases of *blind internal fistulæ*, if the bursting and discharge of the matter should not produce a cure, which they sometimes do, though very seldom, an external opening is to be made into the collection of matter, and then the same operation, as has been already described for other cases, is to be put in execution. The place, where the outward opening should be made, is always sufficiently indicated by the induration.

When the sinuses of abscesses have become really and truly fistulous, in consequence of mismanagement, and their long existence, nothing more is necessary, than to lay them freely open, and dress them with simple unirritating applications. Sometimes, the health must yet be improved, before a cure can be accomplished, and many, who cannot recover in hospitals, do so on removing into the country, where the air is more pure.

CHAPTER XXX.

PROLAPSUS ANI.

OF this complaint, there are three varieties; in one, the rectum, together with all its tunics, falls downward; in

another, only its internal coat is protruded; and in the third species, the upper portion of the intestine descends into the lower one, so as even sometimes to protrude at the anus. The last case is termed a *volvulus*, or *intussusceptio*. When we speak of a *prolapsus ani*, we commonly mean the first kind of disorder. As the intestine descends, it becomes turned inside out: hence, the outside of the protruded part was previously the inside of the gut.

There are two kinds of causes by which the prolapsus may be occasioned, viz. such as weaken the sphincter, and parts, retaining the rectum in its situation; or such as tend to force the intestine downward. Those of the first description are only predisposing; but, the latter causes often occasion a prolapsus quite independently of the others. Costiveness, and hardened feces, which distend the rectum and sphincter ani; and emollient clysters, which relax these parts; are the chief predisposing causes. The prolapsus ani is mostly seen afflicting children and aged persons; the first, on account of the relaxation and elasticity in their systems; the latter, on account of the want of muscular power in the sphincter ani. When the rectum has once descended, a weakness and relaxation are afterwards liable to continue, and bring on a recurrence of the complaint from the slightest causes. Among the second class of causes, we have to enumerate, long-continued irritation and tenesmus, kept up by hemorrhoids; ascarides; fistulæ in ano; a stone in the bladder; diarrhœa; labour pains, &c.

In the treatment of a prolapsus ani, the first consideration is to ascertain the cause of the complaint. Thus, if it arise from any irritation in the rectum, bladder, or neighbouring parts, exciting frequent tenesmus and straining, the primary indication is to obviate the cause of such irritation, and then probably the prolapsus ani will get well of itself. Thus, if a stone in the bladder be the cause, its extraction is necessary for a cure. The irritation of piles is not an unfrequent cause of prolapsus ani. Here the first object in the treatment is to extirpate the hemorrhoidal excrescences. I knew a gentleman who was sadly afflicted for a long time with prolapsus ani and hemorrhoids. The gut used often to fall down quite suddenly, and put him immediately into such pain, that he was sometimes obliged in an instant to abandon his daily employment, and be taken home for surgical advice. At length, he was so frequently attacked in this manner, that, despairing of ever being cured, he was induced to resign his public situation, and salary. After further advice, however, he found that his case was not so incurable; for, one of the next surgeons whom

he consulted, began with curing the hemorrhoidal tumours, after the removal of which the prolapsus ani never troubled him again.*

When the prolapsus is recent and inconsiderable, its reduction may frequently be effected by gentle pressure with the hand. But, when the protruded portion of the gut is large, and the prolapsus has existed several hours, the reduction very often cannot be so easily accomplished. Then the following plan is to be tried. The patient, having emptied his bladder, is to place himself in a position, in which he rests upon his knees and elbows. The surgeon is now to try to reduce the prolapsus, by making alternate pressure, first on one side, then on the other, of that portion of the gut which is nearest the opening, until the whole is returned. Though the whole may have been reduced within the anus, still the gut is ready to protrude again at the first opportunity. Hence the prolapsed piece of intestine must be pushed further upward, than just within the anus.

Sometimes the reduction cannot be effected, on account of an incessant, involuntary, spasmodic straining. Here soft poultices, and opiate draughts, and clysters, are indicated. A great quantity of hardened excrement in the large intestines may render reduction difficult: in this case, the object can frequently be accomplished, after the bowels have been emptied by means of clysters. When the prolapsed portion of the gut is very much swollen, its size may be lessened by applying leeches, or cold lotions to it; or by making long-continued pressure, before trying to reduce it. After the prolapsus has been reduced, the patient must keep himself, for a time, in a horizontal posture, as the intestine is very prone to fall down again. Also, to prevent this event, corroborant astringent clysters may be administered. But, above all things, it is essential to keep the bowels free from costiveness.

When reduction is long delayed, the tumour may become painful and inflamed; and the observations of Schmucker prove, that the same symptoms as attend a strangulated hernia, and even death, may follow the protraction of the disease. The immediate cause of all the mischief is the constriction, produced on the bowel by the sphincter ani. The proper line of conduct for the surgeon is, to employ general,

* I was lately consulted by a surgeon in the country, who was desirous of trying the plan of supporting the end of the bowel with the elastic gum contrivance, which I shall presently notice. As, however, the patient, who was an elderly lady, had hemorrhoids, I ventured to suggest the propriety of trying the effect of first curing them: the result I have not heard.

and, particularly, topical bleeding; cold lotions; and gentle, long-continued, equal pressure. If such measures fail, and the dangerous symptoms increase, it is necessary to divide the sphincter ani, by means of a curved bistoury, and a director.

Every prolapsus is followed by weakness and relaxation of the parts, which naturally retain the bowel in its position; and, for this reason, the complaint, when neglected, often becomes habitual. In this circumstance, a proper bandage, and astringent clysters, may be of service.

The clysters are usually composed of the decoction of oak bark, with alum, port wine, &c.

When these fail, some benefit may be obtained from wearing the T bandage, with a piece of sponge, applied, as a compress, to the anus. It is to be observed, however, that though bandages keep up the bowel, a *volvulus* frequently follows their employment; and as they are of necessity taken off when the patient goes to stool, they present a very faint prospect of radically curing even the prolapsus ani, as at the time of straining, the bowel regularly descends. The patient, indeed, should be cautioned to prevent the descent of the gut with his finger; but, he cannot always hinder the accident.

For supporting the end of the rectum, an ingenious suggestion was made a few years ago to try an elastic gum instrument, or pad, constructed with a hole in it, so that the feces might be voided through it, and no need for its being taken off occur at the period, when its support was most needed. The unirritating qualities of elastic gum certainly seem to render it an eligible material for such a contrivance.

When a prolapsus ani has been neglected, and not kept properly reduced, the protruded rectum often loses all vestige of its natural texture, and becomes indurated, exceedingly thickened, and, as it were, quite callous and insensible; the patient experiencing no inconvenience, except what results from a large, hard tumour at the anus. Hence, the disorder is usually left to itself. However, a long perseverance in a horizontal posture, long-continued pressure, and the constant use of cold washes, have, frequently, been known to diminish the size of such a tumour, so as to render its return practicable. If the large callous tumour should ulcerate, impede the exit of the feces, or become in any other way exceedingly troublesome, the surgeon may amputate the part.

VOLVULUS, OR INTUSSUSCEPTIO.

This is hardly to be distinguished from the prolapsus ani.

The protruded intestine is not the rectum; but the colon. The cœcum, and even the ilium, may protrude out of the rectum *: then, of course, the nature of the case is clear, from the structure of these viscera. The parts may be returned into the rectum; but the disease, when it has made much progress, is almost entirely out of the reach of art; for, who can undertake to replace the colon, much less the other intestines, into their natural position? Besides, in the generality of examples, there are such adhesions, as preclude the possibility of any effectual interference. Having elsewhere considered this subject in detail, I shall not here expatiate upon it, more especially as it is a disease, that does not necessarily claim a place in an introductory work.

CHAPTER XXXI.

PROLAPSUS UTERI.

IN this case, the uterus falls down into the vagina, and the os tinæ may be distinguished just behind the vulva. Sometimes the womb protrudes out of the vagina, and the swelling presents itself in front of the external parts of generation. The first is the *incomplete*, the second the *complete*, *prolapsus uteri*.

Patients having an incomplete prolapsus experience various inconveniences, which originate from the pressure of the uterus upon the bladder, and rectum, and from the dragging of such parts as are connected with the displaced viscus. From the first cause, the principal complaints are impediments to the passage of the feces, and retention of urine: from the second, a painful stretching sensation in the loins, which mostly abates, however, when the patient goes to bed, and the uterus is pushed upwards with the end of the finger, and kept there with a pessary. The pressure, and irritation of the tumour on the surrounding parts, are also usually attended with a considerable discharge.

When a complete prolapsus happens, the symptoms arising from the pressure of the uterus upon the adjacent parts dimi-

* Sabatier, in *Mémoires de l'Acad. de Chirurgie*, tom. xv.; Langstaff, in *Edinb. Med. and Surgical Journal*, vol. iii,

nish; but, those, which depend upon the dragging of parts connected with this viscus, now frequently undergo serious exâsperation. The cervix uteri, in descending, always carries downward with it the upper part of the vagina. When the uterus protrudes out of the external parts, the whole vagina is drawn downward with it, so as to cover the external surface of the tumour. The uterus now hangs down at the labia, between which and that organ there is no interspace, into which the finger, or probe, can be introduced. This case cannot happen without the bladder and rectum being considerably deranged, in regard to position. The first is always drawn backward, so as to take the natural situation of the uterus, and assume, as well as the meatus urinarius, a horizontal position. Hence, when it becomes requisite to pass a catheter in these cases, we see in what direction the instrument should be introduced.

As the return of blood from the prolapsed uterus is usually more or less obstructed, the part frequently becomes very much swollen, and even copious discharges of blood occur; and when the displacement exists a long time, the naturally delicate texture of the lining of the vagina undergoes such an alteration, that it seems more like the structure of the common integuments.

If the prolapsus be recent, however, the friction of the clothes on the swelling mostly occasions very painful ulcerations on the outside of the vagina. But, when the parts have been long down, they adapt themselves to their new situation; and, hence, an old neglected prolapsus is often found to be attended with no particular occurrences, except the descent of the tumour, when the patient is erect, and its return when she is in a recumbent posture. The disease in this form may be considered as entirely of a chronic nature, and, if not relieved in its early stage, it may continue for many years. *

Polypi are the only disease, with which the prolapsus uteri can be confounded; and the mode of discrimination must be learnt by referring to the chapter on this other subject.

The causes of the prolapsus uteri are such as either relax the parts retaining the uterus in its natural position, or such as force this organ downward. Women, who have had many children, are particularly subject to the complaint. The prolapsus is also very liable to occur soon after delivery, a period when all the parts of generation are dilated and relaxed.

The second class of causes are, any great exertions, or con-

* Saviard, obs. x. &c. p. 49.; Ruysch, *Observat. Anatom. Chir.* 1—7, and 9; Sabatier, *Mém. de l'Acad. de Chirurgie*, t. iii. p. 361.

cussions of the body; but, we can hardly conceive, that such circumstances would be adequate to the production of the case, if the vagina, and parts retaining the uterus in its situation, were not greatly relaxed. A prolapsus uteri cannot easily happen during pregnancy; and, even when a woman, having this affliction, becomes pregnant, she is generally freed from it, as the uterus enlarges. Yet, there are some cases recorded, in which the gravid uterus suffered a prolapsus*; and the accident has sometimes actually taken place at the time of labour.†

There are two indications in the treatment: viz. to reduce the uterus into its natural position; and to prevent its descending again. When the prolapsus is incomplete, the first object is generally very easy of accomplishment: the second is effected by making the patient wear a pessary in the vagina, and use corroborant astringent injections.

The reduction is remarked to be generally attended with greater difficulty in fat, than in thin subjects.‡

The reduction of the uterus, after it has been long displaced, is often difficult. The operation should be done before the patient gets out of bed in the morning; and, previously to the attempt being made, it is advisable to empty the large intestines, by means of a clyster. Sometimes, in these old chronic cases, the reduction can only be effected gradually, for which purpose, long confinement in bed, venesection, low diet, and emollient applications to the indurated, thickened, and callous tumour, may be regarded as the best means. Afterwards, when the size of the uterus is somewhat lessened, an attempt should be made to push the part gently upwards; a thing, which will be facilitated by taking care to have the pelvis raised, and the rectum and bladder emptied. In some instances, however, the thickening of the prolapsed viscus, and the alteration made in the position of the surrounding parts, render the design quite impracticable. A prolapsus uteri of very long standing, like an old hernia, sometimes cannot be reduced, without the most dangerous symptoms being induced.§ In this circumstance, we must be content with drawing off the urine with a catheter, if requisite, and supporting the part with a bandage.

* Giraud, *Journal de Médecine*, tom. xlv.; Portal, *Mém. de l'Acad. de Chirurg.* tom. iii.

† Ducreux, *Mém. de l'Acad. de Chirurg.* tom. viii. p. 393. edit. in 12mo.

‡ Lassus, *Pathologie Chir.* t. ii. p. 116.

§ Richter's *Chir. Bibl.* 3 b. p. 141.

The presence of ulcerations is no reason for not attempting to reduce the displaced part; but when the tumour is very much inflamed and swollen, we are sometimes advised to defer the attempt to replace the uterus, until the effect of bleeding, fomentations, cold washes, &c. has been tried.

If the uterus were to protrude completely out of the vagina during the efforts of labour, no attempt at reduction ought to be made, which, indeed, would be quite impracticable. On the contrary, the displaced organ should be supported, its orifice dilated, the delivery finished, and the placenta carefully extracted. When this method is adopted, the uterus contracts, its size diminishes, and the reduction is freed from every difficulty. *

About the fourth or fifth month of pregnancy, and sometimes rather later, the uterus may be propelled down by its weight, and present itself more or less out of the vulva, especially in women whose pelvis is capacious, and who have already had many children. The patient now experiences a sense of heaviness about the rectum, painful dragging sensations in the groins and lumbar region, and great weakness and prostration of strength, followed by constipation, and retention of urine, which come on as the prolapsus increases. Here it is of the utmost importance to afford relief as quickly as possible, by confining the patient to her bed, directing her to void her urine in a recumbent posture, and pushing back the uterus with the finger, in order to obviate the retention of urine, which would arise from the displacement of the womb, and its pressure upon the neck of the bladder.

A woman, aged twenty-six, in the fourth month of her pregnancy, while carrying a heavy burden on her shoulders, slipped and fell down. At this instant she was seized with a violent pain in the loins and about the pubes, attended with a total inability to make water. A very ignorant physician who was called to her assistance, instead of drawing off her urine with a catheter, most absurdly prescribed diuretic medicines. For twelve days the poor patient remained in the greatest agony, unable to expel a drop of urine, and she fell a victim to the ignorance of her medical attendant. After her death, the uterus was found displaced into the vagina, and its cervix projecting from between the labia, while the bladder was so enormously distended, that it was two feet in length and one in diameter, and contained twenty pints of urine. It is a re-

* Fabricius, De foetus vivi extractione, utero prolapso. Vid. Halleri Disputationes Chirurg. Selectas, t. iil. p. 431.

flection made by the author who has published this case, that such physicians as have never paid due attention to surgery, must practise their profession with great disadvantage to their patients.*

Girls are very rarely afflicted with a prolapsus uteri; yet, the records of medicine furnish instances in which the displacement was slowly produced in such individuals after some violent effort. A girl, fourteen years of age, during the period of her menses, attempted to throw a bundle of vegetables over a wall. She was immediately seized with violent pain in the loins, and hypogastric region. The following day, the uterus had fallen down into the vagina, and protruded between the labia. For six years the complaint got gradually worse. At the age of twenty-two she married, but did not for some time become pregnant. At length, however, the husband succeeded in dilating the os tincæ with his yard, and consummated the act of generation. The wife went through her pregnancy without any material inconvenience; but, when she was in labour, a portion of the uterus, of the shape and size of a large melon, protruded out of the vulva. It was hard, tense, and so closely embraced by the labia, that it appeared as if it were adherent to them. As the os tincæ did not dilate, two incisions were made through the opposite sides of the cervix uteri, in order to get out the fœtus, which was dead. The delivery was followed by no untoward symptoms; and the lochia were freely discharged. An attempt was afterwards made to effect a gradual reduction of the uterus, which had been so long displaced, by confining the patient in bed, and applying emollient applications and steam. However, she would not continue the plan more than a week, and went to her usual work. The uterus has subsequently remained in the state in which it was before pregnancy, except that the displaced organ appears rather longer and more cylindrical. Ten years after delivery this woman continued well, and able to go through her ordinary country work.†

In recent cases of prolapsus uteri, we may hope to effect a radical cure by bringing the relaxed and dilated parts into another state. This may be accomplished by introducing into the vagina, immediately the uterus has been reduced, a

* "Patet adeoque luculentissime, quam sinistre illi medici, ad multorum hominum detrimentum praxim suam exerceant, qui chirurgiam negligunt." Kulm, Dissert. de Uteri Lapsu, 4to. Gedani, 1732. See Haller's Disput. Chirurg. Selectæ, t. iii. p. 587.

† Chopart, Traité des Maladies de la Vessie, t. ii. p. 73.

sponge, which is to be frequently wetted with some astringent lotion. A compress, supported by the T bandage, is also to be applied to the external parts of generation. The patient must remain in a horizontal posture, and carefully avoid all strong efforts in going to stool, making water, &c. The piece of sponge should be of a globular or cylindrical shape. Cold clysters may likewise be injected.

Whenever a radical cure cannot be performed, though the part be reducible, the only mode of obtaining relief is to persist in the employment of pessaries. For a description of these instruments, I must beg leave to refer to books on midwifery.

CHAPTER XXXII.

INVERSIO UTERI.

SOMETIMES the uterus descends through the os tincæ into the vagina, and occasionally it not only fills the latter passage, but also protrudes quite out of the vulva. The first is the *incomplete*, the second the *complete, inversio uteri*. In the latter case, the vagina is also drawn downward, and inverted, so that the whole tumour, situated before the parts of generation, seems to hang by a pedicle, formed of the inverted vagina; and between this pedicle and the labia, a probe cannot be passed for any distance, as in cases of polypi. At the uppermost extremity of the tumour, the os tincæ may be felt, forming there a kind of circular thickening, and, of course, the uterus is wholly wanting in the hypogastric region. From what has been already premised, it must also be clear, that the outer surface of the tumour was naturally the inner lining of the uterus. When the inversion is incomplete, the fundus of the uterus passes down into the vagina, forming a tumour there of considerable size, presenting a semispherical form, and closely embraced by the os tincæ. In this case, the edges of the depression in the fundus uteri can sometimes be distinguished through the integuments of the abdomen. In the example lately published by Mr. Newnham, the tumour in the vagina had existed about three months; was of considerable size; somewhat of a pyriform shape; larger at its base than at its superior extremity, but not attached by a very narrow neck; surrounded at its apex by the os uteri, between which and the tumour the finger could be readily passed

without discovering any immediate connection; the swelling was nearly insensible; and had never occasioned pain.* The disease had been induced during labour, and was attended with a constant mucous discharge, and frequent hemorrhage.

As the fundus uteri evidently cannot descend through the os tinæ, unless this aperture be very much dilated, it is obvious, that the inversio uteri can only occur immediately after delivery. An unskilful employment of force, in extracting the placenta, is one common occasion of the accident. Polypi, growing from the inside of the fundus uteri, are particular cases, however, in which the inversion of this organ may occur from its being dragged downward by the weight of such tumours.

Here the disease generally comes on in a slow and gradual manner, and is unattended with the violent symptoms which characterize its more sudden formation. Baudeloque, and a few other authors, relate cases, in which the uterus became inverted some hours, or even days, after delivery; but, in such examples, as a modern author observes, it is to be presumed, that a depression or partial inversion of that organ existed previously to the period assigned for the commencement of this displacement, and had *afterwards* become complete.†

The most frequent cause of inversion of the uterus (says Mr. Newnham) is the imprudent management of the placenta, and rude attempts to hasten its expulsion by pulling at the cord; but, this accident may likewise be occasioned, when the patient is encouraged to make vehement voluntary efforts to bear down at the moment when the foetus is about to be pushed into the world. It may be produced by the child being suddenly born, while the woman is in an erect position. Excessive capacity of the pelvis may be a predisposing cause. The disease may also be induced by carelessness in the management of delivery, when the funis is either preternaturally short, or is rendered so by being coiled round other parts of the body.‡ The too great projection of the sacro-vertebral angle is mentioned as a circumstance which may be conducive

* See An Essay on the Symptoms, Causes, and Treatment of Inversio Uteri, with a History of the successful extirpation of that Organ, during the chronic stage of the Disease, by W. Newnham, esq. p. 41. 8vo. Lond. 1818. This work contains a good deal of valuable information, with a review of the opinions of the most distinguished writers on the subject.

† Op. cit. p. 32.

‡ Ib. p. 5.

to the accident.* An inversion of the uterus is also very liable to happen at the time of labour, when the patient has been previously subject to a prolapsus of that organ.† In order to prevent an inversion of the uterus, practitioners in midwifery are advised to wait for the return of uterine pain, before they employ any manual force for the extraction of the placenta; and, where the removal of this body is immediately necessary, they are advised to effect the purpose rather by exciting uterine contraction, than by pulling the funis. During the last stage of labour, when the head is born, the accoucheur should await the return of the pains, and not too hastily proceed to the delivery of the trunk by manual assistance. In every instance, and, especially, when the pelvis is large, the patient is to be kept in a horizontal position from the moment that the head begins to press upon the perineum; and every precaution is to be taken to hinder the shortness of the funis, or its tension from any other cause, from having the effect of drawing down the placenta.‡

An inversion of the uterus is commonly attended with extreme pain and hemorrhage; but it is remarked, that the bleeding is not always in proportion to the degree of inversion. The accident is constantly followed by more or less inflammation and swelling of the displaced organ, and, when the case has suddenly occurred in its complete form, nausea, fainting, mortification, convulsions, and death may be the result. In the generality of cases, the prostration of strength is at first very considerable, the countenance pale, and the pulse fluttering and scarcely distinguishable.

Sometimes an inversion of the uterus does not prove immediately fatal, but the patient falls a slower victim to the effects of the subsequent inflammation, gangrene, fever, retention of urine, &c. And, as a late writer observes, if the patient has sufficient strength of constitution to struggle through the severity of her sufferings, the uterus may diminish to its natural size; she remains subject to a debilitating hemorrhage, and a constant mucous discharge; she has repeated attacks of protracted and alarming syncope; dropsical effusions, or hectic fever succeed; and the patient, after vainly combating with

* *Mémorial sur l'Art des Accouchemens* par Madame Veuve Boivin; Paris, 1817. This book, which I have not seen, is mentioned by Mr. Newnham in terms of great praise.

† Windsor in *Medico-Chir. Trans.* vol. x. p. 360.

‡ Newnham, *op. cit.* p. 6.

her hopeless situation, is conducted to the grave in the most miserable manner.

In a few instances, women survive all these accidents: the uterus contracts to its natural size, and no longer causes urgent inconvenience. Menstruation is performed as usual, though generally it is more profuse than natural, and, during the intervals, a considerable discharge of mucus prevails. In this unnatural state, the uterus is particularly liable to the attack of scirrhus, gangrene, and malignant ulceration. *

In the records of the profession, extraordinary instances are reported, in which incomplete inversions of the uterus either underwent a spontaneous cure †, or were removed by the long-continued employment and pressure of pessaries.

In a few uncommon cases, also, where mortification has taken place, the inverted uterus has sloughed away, and, the patient surviving all the indisposition arising from the disorder, a termination has been put to the original complaint. ‡

In practice, it is a matter of the highest importance to be early acquainted with the existence of the disease. It has often happened, that the death of the patient has taken place from hemorrhage, and the cause has never been discovered, till, upon examination after death, the uterus was found inverted in the vagina. § Hence, after the delivery of the placenta, Mr. Newnham very judiciously recommends the accoucheur to introduce one or more fingers into the vagina, in order to ascertain, that no such displacement has occurred.

The method of distinguishing the case from a polypus, will be noticed in a subsequent chapter.

The reduction of the inverted uterus ought not to be delayed a moment. The longer the operation is deferred, the more difficult it becomes; for, pain, inflammation, and swelling, come on with great rapidity. Denman found the reduction impossible as early as four hours after delivery.

When, in an inversion of the uterus, the placenta has not separated, Baudeloque, Capuron, and others, recommend it to be taken away previously to the attempt at reduction; but, Mr. Newnham joins gentlemen, who disapprove of this mode of proceeding, on the ground of the irritation which it causes, and, because it is conceived, that the presence of the placenta

* Newnham's Essay on Inversio Uteri, p. 9, 10.

† Capuron, *Traité des Maladies des Femmes*, p. 512.

‡ Nauche, *Maladies de l'Uterus*, p. 130.

§ See a recent example referred to by Mr. Windsor in *Medico-Chir. Trans.* vol. x. p. 361.

will have a good effect in bringing on that regular and natural contraction of the uterus upon which the patient's safety depends.*

The following are the directions which the foregoing writer gives for the reduction. If, says he, the inversion be only partial, and the accident recent, it will be sufficient to make gentle pressure on the fundus of the uterus with the fingers united in a conical form. But if the inversion be complete, and the disease has existed a few days, or even hours, the difficulty will be much increased, and a method somewhat different must be employed. Here, as the cervix uteri is closely applied round the root of the swelling, it is best to introduce the hand, and gently grasping the tumour, endeavour to reinvert the uterus, by returning first that portion of it, which was last expelled from the os uteri. This process will be considerably assisted by pressing upwards the fundus of the uterus, while its superior portion is gently compressed.

The inversion having been reduced, the hand of the operator is not to be withdrawn from the uterus †, before this organ sensibly contracts, and the placenta is expelled into the vagina. The contraction of the womb may be promoted by frictions upon the abdomen, and the application of warm flannels; and, when these means have been adopted with success, a full dose of opium is to be given, in order to support the patient's strength, prevent syncope, and restrain hemorrhage by exciting the contraction of the uterus. ‡

When the uterus has been inverted some time, and the reduction has become very difficult, or impracticable, in consequence of the inflammatory swelling of the displaced viscus, the best practitioners all agree, that it would be highly improper to persist in rough manual endeavours to remove the inversion. The right practice, as experience fully proves, here consists in having recourse in the first instance to bleeding, (if the patient's state will bear it,) fomentations, the warm bath, anodyne clysters, gentle aperient medicines, and the lowest diet. When, by these means, the inflammatory swelling of the uterus has been diminished, the attempts at reduction may often be made with complete success. In every case of unreduced inverted uterus, attended with retention of urine, the catheter must be employed.

In very old cases, in which the fundus uteri has suffered long compression in the vagina, the womb becomes altered in

* Newnham, op. cit. p. 14.

† Also Lassus, *Pathologie Chir.* t. ii. p. 121.

‡ See Newnham's *Essay on Inversio Uteri*, p. 15. &c.

its structure and figure so much, that the inversion is totally incurable, and the further descent of the part is then to be prevented by the employment of a pessary.

The uterus, besides being completely inverted, may also be in a scirrhus, or actually cancerous state; a change, to which, as I have already observed, the very displacement of the organ, when long continued, appears to produce a tendency. In this circumstance, there are precedents enough on record, exemplifying the propriety of amputating the diseased organ, or extirpating it with a ligature. * When also the uterus is inverted, without being cancerous, and all chance of reduction is out of the question, and the patient suffers so much from the disease as to endanger her life, and destroy her comfort, the mass of evidence collected by late writers tends clearly to prove the expediency of attempting the extirpation of the uterus by means of a ligature. In Mr. Windsor's case, the operation was effected partly by the ligature, and partly by the knife: in Mr. Newnham's example, the separation was accomplished with the ligature alone. The first of these gentlemen appears inclined to think, that, as the action of the ligature is tedious, it would greatly curtail the patient's sufferings, and the practitioner's suspense, if the excision of the uterus could be safely adopted at once, instead of employing a ligature. In support of this opinion, he refers to cases, in which the excision of the uterus was followed by recovery, and cites the example mentioned by Wrisberg, and related at considerable length by Dr. Hull †, where the uterus was cut away by an ignorant midwife immediately after its inversion, and consequently where the peritoneal cavity must have been extensively opened, yet the patient recovered. ‡

When the inverted uterus lies in the vagina, Mr. Windsor believes the ovaria and fimbriated ends of the Fallopian tubes generally lie on the brim of the inverted part, but not within it, though he has seen one such case. These parts (says he) probably become somewhat agglutinated by adhesive inflammation, and also connected by the same process to the bladder

* See Journal de Médecine, tom. xli.; Fourcroy, Médecine Eclairée, tom. iv.; Dieterichs, von einer Absetzung der Gebärmutter, Regensburg, 1745, &c.

† P. 119—126. Letter 2.

‡ Since this sheet was sent to the press, I have read the history of the extirpation of a cancerous uterus, in a state of prolapsus, but not inversion. The operation was performed by Langenbeck entirely with a knife, and the patient soon recovered. It appears, that the ovaries and round ligaments were also removed. See Langenbeck's Neue Bibliothek für die Chirurgie, b. i. p. 551. Göttingen, 1818.

in front, and to the rectum behind; and hence, he thinks there may be less danger of opening the peritoneal cavity, when excision is practised in the chronic stage. In some cases, either originally, or by time, the peritoneal connections becoming elongated, the fundus of the inverted uterus projects beyond the external parts; and then the ovaria and fimbriated ends of the Fallopian tubes may be within the cavity of the inverted uterus. It appears also from Mr. Windsor's account, that after the protruding uterus is removed, the os uteri is soon restored to its contracted state; a change, which is of great use in tending to prevent any descent of the abdominal viscera through that opening.

Mr. Windsor suggests, that it would probably be best, before undertaking the operation of excision, first to apply a ligature above the part about to be removed, in order to command the hemorrhage.* In a day, or two, he conceives, that the adhesive inflammation would have taken place in a sufficient degree to obviate the risk of hemorrhage, and that the ligature might then be safely taken off.

If, however, the ligature should be preferred to excision, Mr. Windsor thinks the process of separation might be considerably accelerated by following Dr. Hull's suggestion, and passing a needle through the uterus, two cannulæ being used, instead of one, and each ligature comprehending half the neck of the swelling.†

The uterus, removed by the foregoing gentleman, measured three inches from the fundus to the cervix, and the same from side to side. When cut open, a part of the Fallopian tubes and ligamenta rotunda was exposed; but, the ovaries and fimbriated extremities of those tubes had not been removed. The length of the part of the tubes taken away was two inches and a half; their terminations were capable of admitting a bristle; a small quantity of coagulated lymph was noticed on the peritoneal surface of the uterus; and this organ was open at the part where it had been divided, the opposed peritoneal coverings not having become sealed by the adhesive inflammation.‡

Although the reflections made by Mr. Newnham in his valuable essay upon this subject, and the cases recently published by him and Mr. Windsor, taken in conjunction with the

* In Langenbeck's case, the bleeding was profuse, but the plan here recommended was not found necessary.

† See Some Observations on Inversion of the Uterus, with a Case of successful Extirpation of that Organ, by John Windsor, in *Medico-Chir. Trans.* vol. x. p. 385—387. Lond. 1819.

‡ *Ib.* p. 380.

other numerous successful instances of the extirpation of the uterus now upon record, appear fully to justify the attempt under the circumstances already specified, I should recommend practitioners never to be anxious to adopt so severe a measure, except where the impossibility of reduction is beyond all doubt, the sufferings of the patient great, and the continuance of the disease likely to prove fatal. As a contrast to the impressions in favour of the operation, made by a perusal of the interesting cases published by the above surgeons, we are to recollect, that, in many other instances, the application of a ligature round the inverted uterus has been followed by instantaneous disorder of the stomach, extreme agony, peritonitis, and death. At the same time, it is to be taken into consideration, in estimating the reasons for and against the measure, that, in a large proportion of the cases which might be adduced as proofs of its ill success, some discrimination would be requisite to form a true judgment of what part of the bad and fatal symptoms arose from the action of the ligature, and what from the effects of the disease itself.

Whether the operation be done with a ligature or the knife, it is important to recollect the possibility of the abdominal viscera occupying the cavity of the inverted uterus. An instance of this occurrence may be perused in the writings of Vander-Wiel *: a woman died half an hour after delivery, with an inversion of the uterus, which organ was as large as a child's head, and hung down between the patient's thighs. Upon an incision being made into the lower part of the tumour, the intestines presented themselves. The bowels, by thus falling into the preternatural cavity of the inverted uterus, may not only become strangulated, but by their quantity form an impediment to the reduction of the tumour.

CHAPTER XXXIII.

RETROVERSIO UTERI.

THE uterus may either be turned forward or backward; the last displacement is the most common, and is named *retroversio*. In the first case, sometimes called *anterversion of the womb*, the fundus of this organ becomes situated towards

* Centur i. Obs. 67.

the os pubis, over the fundus of the bladder; while the os uteri is inclined towards the sacrum, and middle part of the rectum, and is often situated so high up, that it can hardly be reached by the finger.

The patient generally experiences a constant inclination to make water; feels pain whenever pressure is made above the os pubis; and, on standing up, perceives a hard body fall on the bladder, compelling her to empty this receptacle; but, the tumour regularly falls backward again, when she lies on her back.

In general, this case may be easily relieved. The practitioner should place the patient on her back, and make pressure with his hand just over the os pubis. At the same time, a finger, introduced to the upper part of the vagina, is to press it forwards, so as to urge the os uteri in the same direction, while the pressure of the other hand is tending to push the fundus backwards. The recurrence of the accident is to be prevented by introducing a pessary to support the os uteri; keeping the patient on her back; and applying a compress and bandage to the abdomen just above the pubes.

In the true retroversio, the os uteri inclines towards the pubes, while its fundus is approximated to the sacrum, and descends so far between the rectum and vagina, that it occasions a tumour at the posterior side of the latter tube. The uterus, thus situated, may render the passage of the feces exceedingly difficult, and even impossible. As the preternatural position of the uterus necessarily displaces the bladder and urethra, a greater or lesser degree of retention of urine always occurs, which is the more troublesome, as the catheter, in such circumstances, is sometimes difficult of introduction; the orifice of the urethra being occasionally drawn so far upwards, that it is situated higher than the arch of the pubes. When the bladder is very much distended, it prevents the os uteri from being felt with the finger. The retroversio uteri commonly happens during the second, third, or fourth month of pregnancy. In the latter months, the uterus is too bulky to become situated between the vagina and rectum.

It was the opinion of Dr. W. Hunter, that the retroverted uterus should always be replaced as soon as possible. The longer the case has lasted, the more difficult it is to rectify it, and the greater is the danger of the occurrence. The greatest urgency arises from the retention of urine, and impediment to the passage of the feces; and the distention of the bladder and rectum must naturally render the reduction of the uterus more difficult. As Dr. Hunter has remarked, that whenever the impregnated uterus is once thrown into the preceding unna-

tural position, and continues in it some time, it will probably always remain so, *unless reduced by art, before it becomes so bulky as to be locked in the grasp of the pelvis*: and, in proportion as this process advances, the discharge both of urine and stools will become more difficult; and at length both will entirely be suppressed. When such suppressions once begin they aggravate the evil, not merely by causing pain, but by occasioning a load of accumulated urine and feces in the abdomen above the uterus, pressing it still lower into the cavity of the pelvis, at the same time that the distention of the bladder in this state, draws up that part of the vagina and cervix uteri, with which it is connected, so as to throw the fundus uteri still more directly downwards.* Sometimes, abortion takes place, and this event has been occasionally known to be productive of relief.

As the return of the uterus to its natural position is always greatly facilitated by drawing off the urine with a catheter, this operation should be first performed. The utility of this proceeding may be well appreciated, when it is known, that the uterus has often spontaneously resumed its proper situation, as soon as the bladder was emptied.† In these cases, however, so much difficulty has sometimes been experienced in introducing a catheter, that practitioners have been obliged to puncture the bladder‡; and the neglect of this measure has even been known to end in the bursting of the bladder and a fatal extravasation of urine.§ The inability to introduce the catheter has generally proceeded from the practitioner not recollecting the manner in which the meatus urinarius is displaced, and, when its new horizontal course is duly adverted to, I believe a catheter may be generally got into the bladder, and the necessity for puncturing the latter viscus entirely obviated.

One case of rupture of the bladder, recorded by Van Dœveren in the work named in the margin, is highly interesting, and quoted in Dr. Merriman's valuable tract||: it is entitled "*Vesicæ Urinariæ immanis distensio et rupturâ lethalis, in gravidâ, absque verâ urinæ suppressione, ante mortem ignorata.*" From this relation, we learn, that the patient,

* Hunter, in *Medical Observations and Inquiries*, vol. iv.

† Cheston, *Medical Communications*, vol. ii.; Croft, *London Medical Journal*, vol. xi.; Hunter, *Medical Observations and Inquiries*, vol. iv.

‡ Cheston, *lib. cit.*

§ Lynn, in *Medical Observations and Inquiries*, vol. iv.; Van Dœveren, in *Specimen Observationum Academicarum, ad Monstrorum Historiam, Anatomem, Pathologiam, et artem obstetriciam, spectantium*, 1765.

|| A Dissertation on Retroversion of the Womb, including some Observations on Extra-uterine Gestation, by Sam. Merriman, M. D. 8vo. Lond. 1810.

twenty years of age, in the second month of her first pregnancy was attacked with pains in the loins and other complaints, which were supposed to be the precursors of miscarriage. Her bowels were confined, and she had some difficulty of making water; but, as she daily passed a certain quantity, no suspicion was entertained, that the retention and accumulation of urine in the bladder was the cause of her complaints. Her complaint was mistaken for a dropsy of the womb, and the case being wrongly treated, she soon died. On dissection the bladder was found enormously enlarged and ruptured; the uterus nearly filled up the cavity of the pelvis, and pressed the meatus urinarius so firmly against the ossa pubis, that it impeded the flow of urine. Van Dœveren laments that he had been so much deceived, as he says, the introduction of the catheter, often repeated, would have relieved the symptoms, till the uterus progressively increasing in size, might have ascended into the abdomen.

Writers also usually advise emptying the rectum with a clyster; but when the retroversion is considerable, this bowel is so compressed, that very little of any injection can be got into it, and, perhaps, if a small quantity were to be introduced merely into the portion of the gut below the swelling, it could have no effect in bringing down the feces accumulated above the obstruction, though it must be these which it is chiefly desirable to get away. As, however, the trial of a clyster can do no harm, I would not by any means wish to discountenance the practice, which may be truly useful, when the compression of the rectum is not such as to produce a complete obstruction of that bowel.

The retroversion may take place slowly, in the course of a few days, or quite suddenly. The displacement has been ascribed to the efforts of pregnant women in vomiting, or in emptying the bowels or bladder; to falls, blows, sudden pressure upon the abdomen, and even to violent fright. However, with respect to the causes of retroversio uteri, some difference of opinion prevails. The late Dr. W. Hunter considered, that in women with a large pelvis, the fundus uteri was liable to fall down into the pelvis, and he looked upon the displacement of the uterus as the occasion of the retention of urine. This opinion made him of course an advocate for always employing manual assistance. On the contrary, Dr. Denman imputed retroversio uteri in almost every instance to overdistention of the bladder, as the primary cause, independent of any pressure of the os uteri against the meatus *urinarius.

* Introduction to Midwifery, p. 97. 4to. Lond. 1801.

This theory, says Dr. Merriman, is now almost universally admitted to be correct, and has had the good effect of putting a stop to the rude expedients, which were adopted, while the reduction of the womb was thought to be essential. *

Though Dr. Merriman joins in the belief, that over-distention of the bladder may be considered as the principal occasion of this accident, he thinks, that other external causes are frequently concerned, especially a concussion of the distended bladder. According to the same author, a retention of urine from retroversion of the uterus, may arise at other periods of life, as well as during pregnancy, and generally from the same cause, viz. over-distention of the bladder. Thus, says he, after delivery, the uterus sometimes becomes retroverted, occasioning an entire suppression of urine, and excessive pain; and the same thing not uncommonly takes place when the uterus is in a state of disease, and sometimes at the period of life, when the catamenia usually cease. At this period, the uterus is apt to enlarge and grow heavy, and, in this condition, Dr. Merriman has known it more than once become retroverted. The same author has also seen retroversio uteri happen on the second and ninth days after delivery, and, in other examples, he has known the accident take place in patients, whose uteri were diseased. †

Such practitioners as accede to the sentiments of Dr. Denman and Dr. Merriman, with respect to the usual cause of retroversion of the womb, will of course consider the catheter as the principal means of cure; and the instrument is to be introduced twice, or oftener, in the twenty-four hours. At the same time, the bowels are to be kept open, and the patient perfectly quiet. ‡ Others, who incline to Dr. Hunter's views of the subject, will naturally have recourse to manual endeavours to replace the womb as soon as the bladder has been emptied. To such attempt, Dr. Merriman thinks there can be no great objection, provided it be done cautiously, and no force be used. In general, however, says he, nothing of this kind is either necessary, or advisable. §

* Op. cit. p. 17.

† Ibid. p. 19—22.

‡ Dr. Hunter attended a case, in which a retroversion of the womb happened in the fourth month of pregnancy, and being incapable of reduction, soon occasioned the patient's death. In such a case, he questions, whether it would not be advisable to perforate the uterus with a small trocar, in order to discharge the liquor amnii, and thereby render the uterus so small and lax, as to admit of reduction? In the unfortunate instance alluded to, the catheter was used; but, probably not often enough, as the bladder was found after death enormously distended.

§ Op. cit. p. 24.

In attempting to replace the womb with the hand, authors direct us to make pressure on the fundus uteri, with two fingers introduced into the rectum. The chief impediment to success arises from the projection of the sacrum. Hence, the pressure should be so directed, as to avoid forcing the uterus against this part. The operation should be accomplished while the patient is kneeling, and leaning on her elbows; for, in this position, the uterus becomes more distant from the sacrum. The fundus uteri should be pushed upwards and forwards towards the navel. Sometimes, the pressure may be made with the fingers in the vagina.

Though the usual consequences of an unrelieved retroversion of the impregnated womb are abortion, and (if the urine be not drawn off) retention of urine, and a fatal rupture of the bladder, experience proves, that, under certain circumstances, the uterus may remain in a state of retroversion for a very great length of time, even to the completion of the period of utero-gestation, without producing a total retention of urine, or any alarming symptoms. *

Whenever a retroversion of the uterus has continued to the end of utero-gestation, Dr. Merriman thinks the case may terminate in one of the following ways: —

First; the good form of the pelvis, the health and strength of the mother, and the efficacy and continuance of the pains, may all combine to replace the uterus, and produce a favourable issue.

Secondly; either the want of some, or all of these fortunate circumstances, or injudicious management during labour, may make the patient fall a victim in a few days to the untoward position of the womb, either by a rupture of this organ, or by active inflammation and mortification of the parts.

Thirdly; the uterus being unable to extricate itself, may not undergo these fatal changes, and by the slow process of ulceration, the foetus may be excluded through the rectum, or vagina, and the mother remain alive. †

* See Dr. S. H. Jackson's *Cautions to Women, respecting Pregnancy, &c.* 1798, and Dr. Merriman's *Dissertation*.

† Dr. Merriman, *op. cit.* p. 45. The above statement is confirmed by a variety of interesting facts collected from the author's experience, and the relations of different writers.

CHAPTER XXXIV.

POLYPI OF THE UTERUS.

RUYSCH has given a much better account of polypi of the uterus, than any of his predecessors, and has correctly represented these sarcomatous swellings, as being attached to the uterus by a pedicle, just in the same way as nasal polypi are connected to the pituitary membrane.* But the honour of having elucidated this branch of morbid anatomy, in a greater degree than any other man, is particularly due to Levret. From his numerous observations†, as well as from others of later date, it appears, that polypi of the uterus are of three kinds, in respect of situation. They either grow from the fundus, the inside of the cervix, or from the lower edge of the os uteri. The first case is the most frequent; the last the most uncommon. Polypi of the uterus are generally of a pyriform, or roundish shape, with a thin pedicle, and are almost invariably of that species, which is denominated fleshy; hardly ever being scirrhus, cancerous, or ulcerated. They are for the most part single, of a reddish colour, and a fibrous vascular texture.

The polypus, growing from the fundus uteri, is very difficult to detect in its incipient state. While small, it produces not the smallest perceptible change in the organs of generation. As it increases in size, it distends the uterus, causes a slight enlargement of the abdomen, and often excites a suspicion of pregnancy, which, however, a more attentive investigation soon dispels. The swelling of the abdomen does not take place in the degree, and space of time, which it does in gestation; the menses continue to flow; the breasts do not become full; and, in the progress of the case, no motion is to be felt. While the polypus lies in the uterus, its growth is slow. Even at this early period, it frequently occasions profuse bleeding. Women, afflicted with the disease, are seldom pregnant; and when they are so, parturition commonly hap-

* Ruysch, *Observat. Anat. Chir.* obs. 6. et 58.

† See his *Observations sur la Cure radicale des Polypes de la Matrice et du Nez*, 8vo. Paris, 1759; and his *Essay on the same subject in Mémoires de l'Acad. Royale de Chirurgie*, tom. viii. edit. 12mo.

pens prematurely. Sometimes, however, they conceive, go through utero-gestation without inconvenience, and delivery takes place in the regular manner.*

As the polypus increases, it expands the os uteri, and at length protrudes into the vagina. Sometimes this event is preceded by pains similar to those of labour. When the tumour has arrived in its new situation, as it is no longer compressed by the uterus, it begins to grow more rapidly, and occasion far more troublesome complaints. It presses the bladder and rectum, and thus is apt to disturb the evacuation of the urine and feces. But, in particular, it causes repeated and profuse hemorrhages, which weaken the patient exceedingly, and often bring her to the brink of the grave. The root of the polypus is situated in the os uteri, and is there so compressed, that the blood in the tumour is prevented from returning through the veins; consequently, all the vessels become turgid, and the above effusions of blood are the result. Though these generally cease spontaneously, the least circumstances cause their recurrence, even slight concussions of the body in walking, &c. In the intervals of such hemorrhages, a profuse quantity of a thin mucous fluid is voided, by which the strength is still more reduced. The polypus, the source of this blood and the cause of all this mucous discharge, is frequently misunderstood, and the patient is in a perilous state. Hence, in cases of preternatural discharge from the uterus, the propriety of always examining *per vaginam*.

After the polypus has remained some time in the vagina, it at length forms an outward protrusion. Now it again excites additional grievances. As it cannot descend so low, without dragging the fundus uteri downward with it, and occasioning a prolapsus of that organ, a very painful sensation is generally experienced in the pelvis in standing or walking. The bladder and ureters being also forced into a deranged position, the evacuation of the urine is disturbed or impeded; while the flow of the urine over the polypus, friction, &c. frequently make the tumour inflame, become painful, and even ulcerate.

The polypus, situated in the vagina, or protruding externally, may easily be mistaken for a prolapsus uteri. This serious error may as easily be avoided. The polypus is softer, and less sensible, than the uterus in the state of prolapsus. The imperfect prolapsus uteri, in which this viscus is not turned inside out, is betrayed by the os tincæ, which is plainly perceptible at its lower part. In this situation, the polypus may,

* Levret, Mémoires de l'Acad. de Chirurgie, t. iii. p. 543.

indeed, occasionally have a depression, resembling the os tincae, but easy of discrimination from it. A probe can be introduced deeply into the os tincae; but not into the other sort of aperture. The polypus resembles an inverted pear, that is, it is thickest below, and becomes gradually thinner upwards. The above species of the prolapsus uteri is thinnest below, and gradually increases in width upward. A probe may be introduced by the side of the polypus deeply to the fundus uteri. When passed by the side of the fallen uterus it is very soon stopped.

It is much more easy to distinguish a polypus protruded externally, from a perfect prolapsus of the uterus without inversion. The os uteri at once characterizes the uterus, as it can here not only be felt, but seen. A probe may be passed deeply into the vagina along the side of the polypus, but not so by the side of the uterus. Besides, the figure of each kind of tumour betrays its real nature.

Some uterine polypi have been known to become in time as large as a bullock's heart, and weigh three or four pounds. In this state, their round shape has sometimes caused them to be mistaken by inattentive practitioners for an inversion of the uterus. The latter accident, however, has usually been preceded by a difficult labour, and hence may, in general, be easily discriminated from a polypus.* While the inverted uterus lies in the vagina, its shape is broad above and narrow below; whereas, the polypus is thin above and broad below. For this reason, in cases of very large polypi in the vagina, the os uteri is little dilated, while it is extremely distended by the incomplete descent of the inverted uterus itself. A recent inversion is generally reducible; but if a polypus be pushed up, it descends again immediately the pressure is discontinued.

When the inverted uterus hangs out of the vagina, its figure, like that of the polypus, is thin upward and broad downward, and, like the latter tumour, it has no aperture at its lowest part. Here an erroneous opinion has often led the way to a most mischievous practice, that of amputating the uterus itself, on the supposition of its being a polypus. It is to be observed, that the inverted uterus includes a circular fold at its upper part, next to the orifice of the vagina. This fold is actually the os uteri itself, through which the body of the viscus has descended. There is nothing of this kind to be felt in cases of polypi. The finger, or probe, may be introduced

* In a few uncommon instances, polypi have first protruded immediately after delivery.

deeply into the vagina along the side of a polypus, but not so far along the side of the uterus. The root of a polypus is firm and hard; the upper thin part of the uterus being hollow, has a soft flabby feel. The uterus is also generally described as being much more tender and sensible than a polypus. Difficult labour, the common cause of the inverted uterus, also throws light on the case.

But, notwithstanding the many differences usually pointed out as marks of discrimination between inversions of the uterus and a polypus, whoever will take the trouble of consulting a valuable essay, already referred to in a previous chapter, will agree with Mr. Newnham, that it is *always difficult*, and, perhaps, *sometimes impossible*, to distinguish *partial and chronic inversion of the uterus from polypus*; since, in both diseases, the os uteri will be found encircling the summit of the tumour, round which part the finger may also be readily passed. And, says this author, if, in order to remove this uncertainty, the entire hand be introduced into the vagina, so as to allow the finger to pass by the side of the tumour to the extremity of the space remaining between it and the os uteri, and we find, that the finger *soon* arrives at this point, it will yet be impossible to know, whether it rests against a portion of the uterus, which has been inverted in the *usual way*, or *by the long-continued dragging of a polypus upon its fundus*. Nor will any certainty be gained by adverting to the ordinary *form of the polypus, its enlarged base, and narrow pedicle*, since the records of the profession furnish abundant evidence, that the neck of such a tumour is often as large, and sometimes larger, than its inferior extremity. And, as for the uterus forming a more sensible tumour than a polypus, it is always difficult to distinguish between the sensibility of the tumour, and sensation occurring in neighbouring viscera, which are irritated by the process of examination. The sensibility of the inverted uterus is also greatly diminished in its chronic stage, while the sensibility of a polypus may be increased by inflammation. The polypus is generally said to be a more moveable swelling, than an inverted uterus; but, if it should have a broad stem, it may be quite as fixed as the uterus, which has been long partially inverted, and has had its size lessened by time. Both diseases, it is asserted, may present a smooth or a rough surface, according to their period, and other circumstances. The history of every case is further obscured by the fact, that though inversion of the uterus mostly follows labour, polypi may first make their appearance in the vagina, immediately after the expulsion of the foetus, or placenta. It is also remarked, that an examination of the hypogastric region will not bring us

more certain information; for, independently of the difficulty of feeling the impregnated uterus above the pubes, especially in fat subjects, a large polypus always drags down the uterus further into the pelvis. And if the inversion could be thus detected, it would not be known, whether it were the effect of the weight of a polypus, or not.*

Polypi, growing from the inside of the cervix, or from the margin of the os uteri, soon protrude into the vagina, and, when large, produce similar complaints to those arising from such polypi as grow from the fundus uteri, except frequent profuse bleedings. These seldom occur, because the root of the tumour suffers no constriction in the os uteri. And, as Mr. Levret observes, the patients are more frequently troubled with fluor albus, and a profuse thin discharge, than with actual losses of blood. Hence the necessity of manually examining per vaginam, whether the patient has either a sanguineous or a mucous discharge. Patients, with polypi growing from the cervix uteri, feel an uneasy sense of weight about the rectum and perineum, whereby they are prevented from sitting down with comfort. It deserves attention also, that the finger cannot be passed round the pedicle of the tumour, as it can when the disease grows from the inside of the fundus uteri. When such polypi descend out of the vagina, they may occasion a prolapsus uteri, but not an inversion.

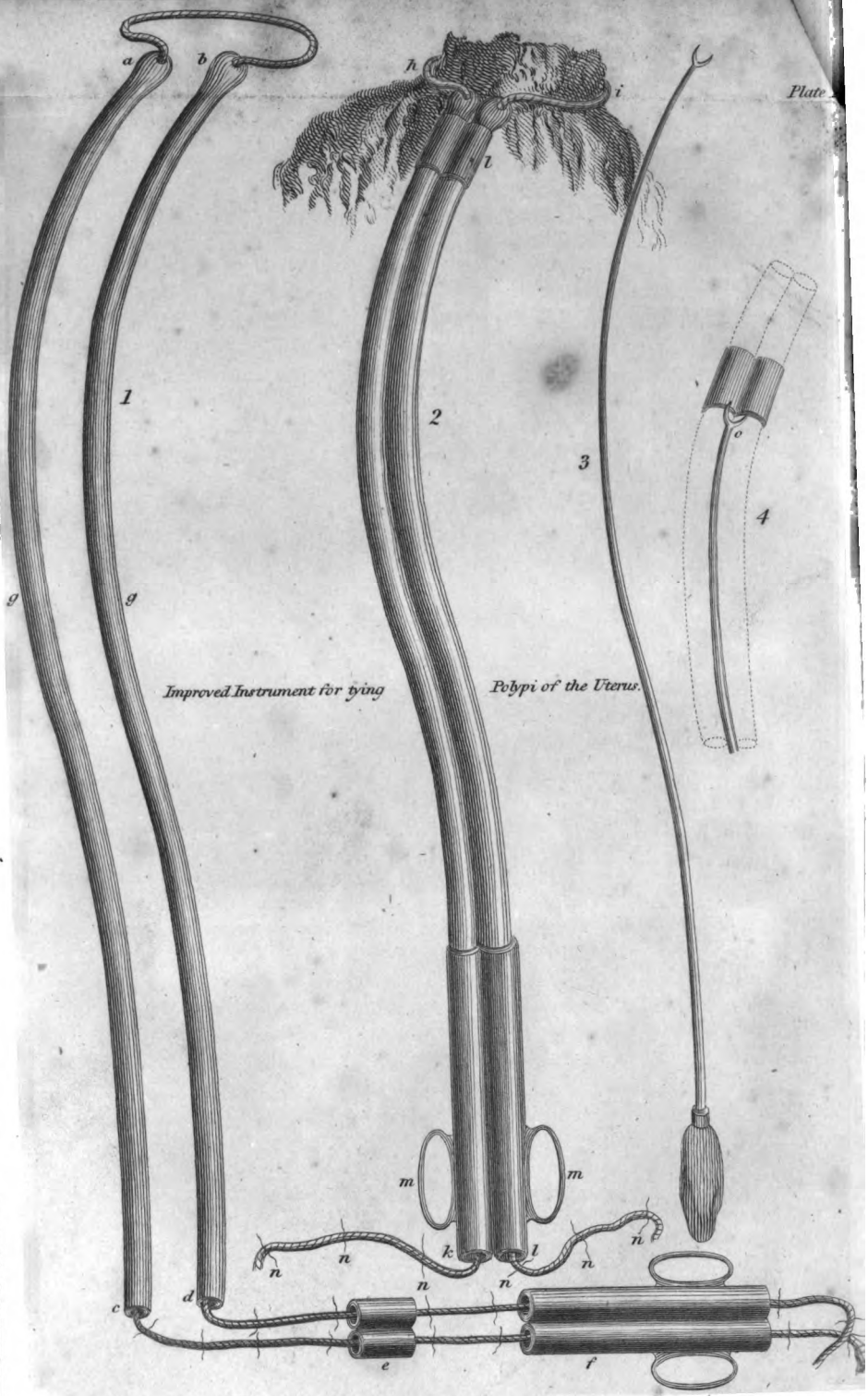
Uterine polypi have sometimes been got rid of by the spontaneous efforts of nature: this has happened, when they have been expelled from the uterus, and had their pedicles so strangulated by the cervix of this organ, as to make them slough away. This mode of cure, however, is to be considered as uncommon, not to be expected, and, perhaps, not desired.

Women who have had children, and others who have not, are reckoned equally subject to polypi of the uterus; nor is the cause of the disease at all known. Experience also proves, that swellings of this nature may even form in the wombs of young girls, exciting complaints resembling those, which usually indicate the commencement of menstruation.†

Uterine polypi, when once extirpated, are not so prone to be reproduced as those of the nose. They ought never to be directly pulled off, as the attempt might produce a prolapsus uteri. A few instances occur, however, in which they may be conveniently twisted off. This is sometimes the case, when

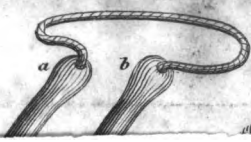
* See An Essay on the Symptoms, Causes, and Treatment of Inversio Uteri, with a history of a successful extirpation of that organ during the chronic stage of the disease, by W. Newnham, esq. p. 82—85, 8vo, Lond. 1818.

† Desault, *Journal de Chirurgie*, tom. iv. p. 276.



Improved Instrument for tying

Polypi of the Uterus.



Plate

11

the pedicle is very thin, or after a ligature has been applied a certain time.

The ligature is the most proper means of extirpating uterine polypi, and is here much more easy of application, than in the nose.

That a polypus cannot be tied, while it lies in the uterus, is easily comprehensible. But, as soon as it has descended into the vagina, the operation is practicable.

The most convenient mode of applying the ligature is by means of two silver cannulæ. * Previously to tying a polypus, I think the advice delivered by Loder well deserving recollection, viz. that the utmost pains should always be taken by the surgeon before the operation, to make himself as accurately informed as possible about the exact point, into which the pedicle of the tumour is inserted. For this purpose, a strong probe will sometimes be a convenient instrument. Inattention to this precaution has occasionally made the operator commit the serious mistake of including a portion of the substance of the uterus itself in the ligature. Such an accident once happened to the celebrated Dr. W. Hunter, as he himself confessed to Loder, and the consequences were mortification of the uterus, and the death of the patient. † It is hardly necessary to mention, that after the tumour has been tied, bleeding,

* See Plate 17. A strong ligature is to be introduced through both cannulæ, so that its two ends hang out of the lower apertures of the tubes (fig. 1.) *c, d*, while its middle portion forms a noose between the two upper apertures, *a, b*. Both the tubes are to be introduced together down to the root of the polypus. One is then to be kept stationary, while the other is to be conveyed round the polypus to the opposite side of the cannula, which is not moved. The ligature being properly applied in this manner, its ends are to be introduced through the little double cylinder *e* (fig. 1.), which is only one-third of an inch long, but so wide as to be capable of being pushed over the two cannulæ, *a b, c d*, with the fingers, as far as the letter *g*, and with the fork (fig. 3.) quite to the letter *l*, (fig. 2.) or letter *o*, (fig. 4.) Then another double cylinder, through which the ends of the ligature have been introduced, *f*, (fig. 1.) and wide enough to pass over the long double cannulæ, is to join together their lower ends *m* (fig. 2.) The ligature is then to be drawn tight, and fastened to the rings.

Herbiniaux has recommended placing pieces of thread, of various colours, on the lower ends of the ligature, with certain interspaces between them, *n, n, n, n*, (fig. 2.) in order to ascertain how thick the root of the polypus is, and how fast the cure proceeds.

This engraving is taken from one in Richter's *Anfangsgr. der Wundarzn.* The ligatures are to be gradually tightened, as they become slack by the destruction of the root of the tumour.

† Loder, *Chirurgisch-Medicinische Beobachtungen*, p. 98, 8vo. Weimar, 1794.

injections, clysters, anodyne and other medicines may be required.

When a large polypus, with a pedicle attached to the fundus uteri, suddenly falls down, it frequently occasions an inversion of this viscus. In order to relieve, as speedily as possible, the great pain and danger of this accident, the surgeon must tie the root of the polypus, as soon and as firmly as he can, and then amputate the tumour below the ligature. The uterus is to be immediately afterwards reduced. This is almost the only instance, in which a cutting instrument can be employed with advantage in the present disease.

Fleshy excrescences sometimes grow in the vagina, some of which have a broad, and others a thin basis. The last merit the appellation of polypi, and may be tied by means of a double cannula, when situated deeply, and, with the hand, when they are near the mouth of the vagina.

CHAPTER XXXV.

LITHOTOMY.

OF THE FORMATION AND INCREASE OF CALCULI.

SOME of the calculi, found in the human bladder, are originally formed up in the kidney, whence they descend through the ureter; while others appear to be first produced in the bladder itself. This last circumstance is often exemplified when the urine is long retained, as in the disease called *cystocele*; or when a foreign body has accidentally passed into the cavity of the bladder*, where it soon becomes covered with calculous matter. When the stone is originally formed in the latter situation, it frequently contains what is termed a nucleus, which occupies its centre, and is composed of the foreign body, round which the strata of calculous particles, or rather the salts of the urine, are deposited. As soon as a calculus has arrived in the bladder, or is once formed there, it constantly increases in size, by reason of the additional calculous matter which continues to be deposited upon its surface. In some instances, the stone enlarges rapidly; while

* Musket-balls lodged in the bladder have sometimes formed the nuclei. See Lungenbeck über eine einfache und sichere Methode des Steinschnittes. Vorrede, p. 29; Larrey, Mém. de Chir. Militaire, t. iv. &c.

in others it remains small for a considerable time; and undergoes a very slow augmentation. Its surface may be smooth, or very rough and irregular; its consistence hard, or softish, and brittle.*

OF THE MANNER IN WHICH CALCULI SOMETIMES BECOME FIXED.

A stone may either be loose and moveable in the bladder; or fixed and connected to some part of that organ, as is the case with those calculi which are commonly named *encysted*. Writers mention four different modes in which a stone may become fixed. It may lodge between the coats of the bladder, just at the lower termination of the ureter, where it has stopped after its descent from the kidney, and grown larger, a more or less considerable part of its surface projecting into the cavity of the bladder. It may lie in a preternatural cyst, or pouch of that organ, where it has been gradually formed from the long-confined or stagnant urine. It may be situated between fungous excrescences, which have arisen from the inner surface of a diseased and ulcerated bladder. Or, lastly, it may be fixed between folds of the indurated coats of that organ.

SYMPTOMS OF STONE.

The following are the common symptoms of a loose calculus in the bladder. The patient is troubled with frequent occasion to make water, more especially when he is upon his legs, or walking about, and, in a less degree, when he lies down, and keeps himself quiet. This symptom is probably owing to the stone falling against, and irritating, the neck of the bladder. While the patient is making water in the standing posture, he experiences at the period when the last drops are coming away, a violent spasmodic pain in the bladder, which is generally thought to be owing to the stone being at the moment spasmodically grasped by that organ. If the patient voids his urine as he stands up, the stream is sometimes suddenly interrupted; but if he lies down upon his back, it flows out again. The reason of these last circumstances is, that, as the urine is flowing out, the calculus falls down against the neck of the bladder, and hinders the further

* For an account of the chemical properties of urinary calculi, I must refer to the Dictionary, and the valuable writings of Wollaston, Pearson, Fourcroy, Henry, Marcet, and Brand.

expulsion of that fluid. It must be obvious, however, that such inconvenience can only happen, when the calculus is not of considerable size. In addition to the foregoing symptoms, the patient feels a good deal of itching and uneasiness in the glans penis,—often conjectured to be a sympathetic effect of the irritation to which the bladder is exposed. This effect also frequently extends to the rectum, occasioning repeated inclination to go to stool, tenesmus, and even prolapsus ani. A sense of weight is felt about the bladder, particularly when the patient moves about, and the stone is of large dimensions. As this body, especially when its surface is rough and angular, or the patient moves about, rubs against and irritates the inner coat of the bladder, severe pain, considerable inflammation, and even ulceration, with bloody urine, are liable to be produced. At the same time, the urine generally has a white, slimy, purulent, gritty sediment. A numbness is experienced in the thighs, and the testicles are sometimes painful and retracted.

An enlarged prostate gland is attended with symptoms resembling those of a stone in the bladder; but with this difference, that the motion of a coach, or horse, does not increase the grievance, when the prostate is affected; while, in cases of stone, it does so in an intolerable degree. In the latter disorder, the paroxysms of pain come on at intervals, whereas the pain from a diseased prostate gland is neither so unequal, nor so acute.

Although the above-mentioned symptoms, particularly when they all occur, make it highly probable that the bladder contains a stone, they cannot be depended upon; and still less are they entitled to implicit reliance, when any of them happen to be absent. Patients have often been known to have a calculus in the bladder, without experiencing any remarkable inconvenience; while others, who apparently suffered the usual grievances of that complaint, have been found in the end never to have had a stone, their afflictions having proceeded from quite another disease, as, for instance, a scirrhus induration of the bladder and neighbouring parts.*

Since, therefore, the symptoms of stone in the bladder bear a strong resemblance to those of various other diseases, no surgeon of ordinary prudence ever ventures to offer a decided opinion in the affirmative, before he has introduced a metallic instrument into the cavity of that organ, and actually touched the stone itself.

* Desault, *Journal de Chirurgie*, t. ii.

OF SOUNDING, OR SEARCHING FOR THE STONE.

The instrument expressly calculated for this purpose is denominated a sound, which is not hollow like a catheter, but solid, and made of the best steel. As a stone, when present, is generally carried by its own weight to the lowest part of the bladder, the sound is made less curved than a catheter, in order that it may be better adapted for reaching behind and below the neck of that viscus. The sound being also only a particular kind of probe, the chief use of which is to convey information through the medium of the organ of touch, its handle should of course be very smooth and highly polished, so that as many points of its surface may be in contact with the fingers as possible.

The mode of introducing this instrument is the same as that of passing a silver catheter; a subject already particularly described in the chapter on retention of urine.

When the extremity of the sound is in the bladder, it is first to be inclined downwards, for the purpose of ascertaining whether the stone occupies its most frequent situation, beneath the convexity of the instrument. If the calculus cannot be felt in this direction, the end of the sound may be gently turned, first to one side, and then the other; and, in the event of the calculus not being now touched, the handle of the instrument is to be depressed, and its extremity inclined upwards and forwards, in order to learn whether the foreign body may not lie more towards the fundus of the bladder. Frequently, the stone cannot be felt before the whole of the urine has been voided, and the bladder contracted; and sometimes the sound cannot be made to strike the calculus, unless this body be first raised up by a finger passed into the rectum, in doing which, the surgeon may occasionally feel the stone, if it be large, through the intervening coats of the bowel and bladder. As, however, this method is seldom requisite, except when the calculus is smallish, the practitioner must not always expect to feel it with his finger through the bowel; nor is it a matter of any practical importance, because the information thus obtained is more liable to be fallacious, than what the sound affords, and, if the stone cannot be felt with this instrument, any kind of feel, communicated to the finger within the rectum, would not amount to a warrant for the performance of lithotomy.

“Examining through the rectum (says a valuable writer) is a very fallacious and unnecessary method of determining whether a stone is present. When the calculus cannot be felt with a sound, all other attempts are needless, and, if

it can be felt with the instrument, they must unquestionably be so. How easily a diseased prostate, an induration of the bladder, sometimes confined to a certain point, may lead to a mistake, is well known. But, besides these circumstances, the truth is, that a stone can seldom be felt through the rectum; and I have extracted some of considerable size, which neither others, nor myself, could feel from that bowel." * Although I fully coincide with this experienced and sensible surgeon, about the examination per anum, I think the method often useful, in raising up the calculus, and putting it within reach of the sound.

When the stone is smallish, and lies on one side of the cervix of the bladder, it may not readily admit of being hit with the sound. Or, when from repeated attacks of inflammation, hardened folds, or, from other causes, distinct cysts, have been formed within the bladder, the calculus sometimes lies within a depression, or cavity, and cannot be felt with the instrument. Under such circumstances, before the sound is introduced, the patient should hold his water, until the bladder is quite full, and, if possible, until it is so distended as to efface, or diminish its preternatural excavations. Then the patient should stand up, and make water with his body inclined forwards, whereby the calculus will be carried towards the neck of the bladder, and admit of being struck with the instrument.† Whenever the surgeon cannot readily touch the stone, the patient is to be sounded in different attitudes.

The sound will not only serve for ascertaining the presence, but sometimes the size and other qualities of a stone in the bladder. When the surgeon regularly finds, in a particular patient, that he is obliged to search a long while before he can touch the calculus with his instrument, and that, after finding it, the least movement of the sound makes him lose it again, it may be suspected that the stone is small. From what has been previously remarked, it must be clear, that some opinion may also be formed of the dimensions of a calculus, by passing a finger within the rectum, the patient having first retained his urine, and then voided it with his body bent forwards, so as to make the stone drop towards the neck of the bladder. It must be more difficult, I think, to ascertain, by means of a sound, whether the calculus is rough, or smooth: though conjectures of its roughness may be derived from observing, that a very little exercise constantly brings on excessive pain, followed by

* Klein, *Chirurgische Bemerkungen*, p. 14. 12mo. Stuttgart, 1801.

† Richter, *Anfangsgr. b. vii. p. 103.*

bloody urine. The feel, communicated by the sound to the fingers, and the sort of collision produced when it hits the calculus, it is said, will sometimes enable a quick surgeon to judge, with some degree of accuracy, respecting the hard, or soft, consistence of the stone. A better criterion is unquestionably the quality of the fragments accidentally voided with the urine; red or brown calculous particles, subsiding in the patient's urine, are thought to indicate a hard stone; but, if they be soft and compressible, what remains behind in the bladder must be supposed to be of the same quality.*

In sounding, how possible it is for a surgeon to mistake a thickened, indurated bladder for a stone in that organ, may be well conceived, when it is considered, that Cheselden, with all his judgment and experience, actually cut no less than three patients, none of whom had any stone in the bladder at the time of the operation. On the other hand, the case of the eminent French surgeon, La Peyronie, exemplifies most convincingly the possibility of failing to discover a stone even of considerable size, though the sound be repeatedly passed.

OF THE SUFFERING AND OTHER CONSEQUENCES OF THE CONTINUANCE OF THE STONE.

The most serious grievances, arising from a stone in the bladder, are frequent attacks of violent pain in the hypogastric region, which are generally exasperated by any mode of living, tending to keep up an inflammatory disposition in the bladder; by the rough surface or angular shape of the stone; and by exercise in an erect position, by which the foreign body is propelled against and made to irritate the neck of the bladder, usually considered its most sensible part. When the paroxysms of pain are violent, they are attended with inflammation and fever. From repeated attacks of inflammation, the coats of the bladder at length become enormously thickened, and this viscus loses its natural shape, and dilatability. A still worse effect, ulceration of the bladder, may ensue; indicated by pus being blended with the urine, by this fluid becoming bloody from the slightest causes, by the unremitting nature of the pain in every position, and external pressure increasing the agony. In advanced cases, the patient is also a prey to hectic symptoms. As the irritation of the stone invariably compels the sufferer to make water with

* Richter, vol. cit. p. 105.

great frequency, the bladder is never subjected to much distention, but, becoming more and more contracted, at length loses its natural dilatability, and is hardly capable of retaining any water at all.

METHODS OF RELIEF.

There are two modes of treating calculous patients usually considered by writers: one is that of attempting to dissolve the stone by medicines,—a subject, which will be omitted in the present work; the other, that of extracting the stone by a surgical operation. In women, the latter object may often be accomplished by dilating the meatus urinarius, without using any cutting instrument*; but, in the male sex, unless the stone be very small, and happen to be spontaneously discharged with the urine, an incision into the bladder is absolutely requisite.

In addition to the advice above given, with regard to the caution, with which a surgeon should offer an opinion about the presence of a stone in the bladder, before the patient has been searched, I have now to remark, that, though the calculus may have been felt with a sound, at some period or another previously to the time fixed upon for the operation, it is an established maxim in surgery *never to perform lithotomy, unless the stone can be plainly struck with a sound, or staff, immediately before the operation.* A man may have a stone in the bladder to-day, and the surgeon may strike it so manifestly with the sound, as to make the circumstance perceptible to the ears of the by-standers, as well as to his own fingers; but to-morrow, the stone may have protruded through the fasciculi of the muscular fibres of the bladder, carrying along with it a pouch, formed by the lining of this viscus, and, in this circumstance, the stone is no longer in the cavity of the bladder; consequently, it can neither be felt by sounding, nor extracted by the operation of lithotomy.

* Notwithstanding the many respectable advocates for this practice, it should be known, that there are some men of considerable eminence who object to it, as being more tedious and painful, and more likely to be followed by an incontinence of urine, than the use of a cutting instrument. Of this sentiment is the experienced German surgeon Klein, who has tried both methods, and in 1816 had cut for the stone 79 patients. See *Practische Ansichten der bedeutendsten Chirurgischen Operationen, auf eigene Erfahrungen gegründet von D. C. Klein, p. 21. 2tes Heft, 4to. Stuttgart, 1816.*

PREPARATORY TREATMENT.

With respect to preparing the patient for lithotomy, little need be said. However, I do not agree with writers, who boldly pronounce all preparatory measures superfluous. On the contrary, as the chief dangerous consequence of this operation is inflammation of the bladder and peritoneum, I think the common principles of surgery teach us, that it must be a matter of prudence to remove if possible before-hand, any state of the constitution known to promote the access of inflammation. Except when the patient is already much debilitated, a low regimen for a few days previously to the operation, cannot I think be improper. A dose or two of salts may also be advisable. A plethoric subject, it might even be right to bleed, if not before, at all events immediately after the operation.* A few hours before the patient is cut, the rectum should always be emptied with a clyster, as its distention must expose it to injury, particularly when the incision is made downwards and outwards, the direction which various important reasons make some of the best surgeons in Europe consider the most advisable. Whether any good results from giving a dose of opium a little while before the operation, I cannot say, as it is a practice which does not prevail in England. Klein speaks favourably of it, however, and says he never omits it, either when lithotomy or any other considerable operation, is to be done. The patient wishes for the medicine himself; it lessens pain; and it facilitates the introduction of the sound, by diminishing spasm about the neck of the bladder.†

It is generally considered advantageous to have the bladder somewhat distended with urine when the patient is cut, and hence, he is usually directed to avoid making water for an hour or two before the operation. This advice I consider well founded, particularly when a gorget is to be thrust into the bladder, which in an empty state must be more liable to be wounded at its posterior part; but, in operating with a knife, whether this organ contain urine, or not, cannot be a matter of importance, unless the escape of the urine, when the instrument enters the bladder, is to be considered as useful information. Klein, who is in the habit of using a common scalpel, says,

* The objection to bleeding before lithotomy is, that the patient sometimes loses a considerable quantity of blood in the operation itself.

† Klein, *Chirurgische Bemerkungen*, p. 28.

he never gives himself any concern about the bladder being empty or not.*

POSITION OF THE PATIENT IN THE OPERATION.

I observe, that, in our public hospitals, the table upon which the patient is placed, slopes down like a desk, so that his pelvis is situated lower than his thorax. Whoever reflects for a moment upon this subject, will immediately agree with Klein, that such a table must have the effect of rendering lithotomy more difficult and hazardous, than when a common table, with a perfectly level surface, is employed. In fact, any common table of proper size, and sufficiently firm, will answer; which is also a fortunate circumstance, inasmuch as it would be impossible always to procure in country-practice a regular operating table. When the patient is placed upon a flat surface, it is much easier to introduce an instrument in the direction of the axis of the pelvis, than when the table slopes, the posture of the patient then making the operator liable to cut too low, and endanger the rectum. When the table is flat, the mass of intestines is less likely to press downwards upon the bladder, and form a protrusion in the middle of the operation, as happened to Bromfield; though, as Klein judiciously remarks, even supposing in this case the previous existence of an incomplete perineal hernia, it is incomprehensible how the protrusion could have happened in the operation, unless some very egregious blunder had been made. By laying the patient on a flat table, he is also prevented from overlooking the operator, and terrifying himself with the sight of blood and instruments. When the patient is put on a sloping surface, the operator must kneel down to gain the advantages, which he fully has sitting down at his ease, before a table that has a straight even surface.† The table should be high enough to make the perineum on a level with the surgeon's breast. The buttocks should be somewhat more raised than the abdomen; the patient lie upon pillows conveniently placed; and the nates project rather beyond the edge of the table.‡

A staff is then to be introduced into the bladder. Two strong garters or ligatures, each about two yards long, are

* See Klein's *Chirurgische Bemerkungen*, p. 26.

† *Ib.* p. 23.

‡ C. J. M. Langenbeek über eine einfache und sichere Methode des Steinschnittes mit einer Vorrede von Dr. J. B. Siebold p. 44. Würzburg, 1802.

then to be doubled, and placed by means of a noose round the patient's wrists, who is next to take hold of the outside of his feet with his hands, in such manner that the fingers are applied to the soles. The two ends of the ligature are then to be carried in opposite directions round the ankle, over the back of the hand, and under the foot, when they may be tied in a bow. The hands and feet being thus securely connected together, the knees and feet are to be supported, kept steady, and held apart by the assistants. Binding the patient in the foregoing way is undoubtedly an extremely unpleasant proceeding; but, as much danger would result from the patient's moving about in particular stages of the operation, all the most experienced surgeons deem it a matter of necessity and prudence. Upon children indeed it is quite impossible to operate, unless they be properly fixed with garters, or ligatures.

In arranging the posture of the patient, the chief objects to be attended to are, first to have the buttocks exactly even; to take care that neither of the assistants draws the thighs too much towards his own side; and that the parts, situated between the raphe of the perineum and the ascending ramus of the ischium, are stretched, in which condition, the requisite incisions can be performed with more facility.*

OF THE STAFF.

I have said, that this instrument should be introduced before the patient's hands and feet are bound together. We have two good reasons for observing this rule; first, because, if the calculus cannot be felt with this instrument, (which being now used for the sound saves the patient the pain of a double introduction through the urethra,) it will not be necessary to tie up the patient at all, as the operation must not be attempted; secondly, because, while the patient is unbound, the instrument is more easy of introduction, and in searching for the stone, a change of posture is often necessary.

A curved director, with a groove for guiding a cutting instrument into the bladder, is an exact definition of a staff. It is shaped like a sound, or catheter, in order to admit of being introduced through the whole course of the urethra. However, it is more curved, and longer, than those instruments; and its handle, instead of being smooth like that of a sound, is generally rough, in order that it may be held with greater

* *Langenbeck über eine einfache und sichere Methode des Steinschnittes, &c.* p. 12.

steadiness. I think also with Klein * and Langenbeck †, that a staff is more convenient to hold, when its handle is somewhat turned back, like that of a spoon. Two advantages are generally supposed to arise from its extremity being more curved, than the end of a sound, or common silver catheter; viz. its convexity is more plainly distinguishable in the perineum; and by depressing the handle of the instrument, when the gorget is to be pushed along its groove, the latter part can be more readily made to take a course corresponding to the axis of the pelvis. The length of the staff is recommended, because the greatest mischief would happen if the instrument were not to extend fairly into the bladder, at the moment of employing the gorget. A staff, however, is frequently made considerably too long, so that it reaches to an immoderate distance within the bladder, more especially at the period, when its handle is brought forwards, its beak raised, and the gorget is passing along its groove. It is to such a cause, that one may partly ascribe occasional wounds of the further part of the bladder and even of the peritoneum, because the further the gorget proceeds, the more difficult it becomes to keep its beak securely in the groove of the staff. Another common fault in the construction of the latter instrument, very conducive to such a disaster, is having its point more bent up than the rest of its curvature, and unclosed by any transverse ridge for stopping the further advance of the beak of the gorget. On the contrary, every staff, instead of having the termination of its groove open, should end in a smooth, bluntish, conical beak, reaching about one-fourth of an inch from the end of the groove. This is the form of the staff represented in the sixth plate of Langenbeck's valuable publication, and what every considerate surgeon must approve of ‡; for, I presume, no lithotomist, whatever may be his kind of gorget, can intend the beak of this last instrument, when passed to the furthest degree, ever to quit the groove of the staff.

The groove of a staff should always be made deep and broad; and the instrument should have a largish diameter, for the wider it is, the more easily may it be felt in the perineum, the more distended the membranous part of the urethra becomes, and the more regular the incision in it is likely to be made. By using a broadish staff, the risk of making a false passage must

* Chirurgische Bemerkungen, p. 31.

† Op. cit. p. 43.

‡ Klein considers a beak unnecessary; but is very particular in recommending the termination of the groove to be closed.

also be lessened *; though the employment of any force adequate to the production of such mischief must always in stone cases be totally unjustifiable.

Both Klein and Langenbeck express their disapprobation of a staff which is immoderately curved. They assert, that this form is of no essential use in making the instrument more distinctly perceptible in the perineum; and the latter gentleman, who is now considered one of the best surgeons in Germany, assures us, that, feeling the staff in the perineum is never any guide to him in making the external incision, as the feel of the bones affords the requisite information. A staff, says he, which is much bent, is also difficult to introduce; while one less curved, may in reality always be felt plainly enough in the perineum. † That the instrument is fairly in the bladder may always be known by its handle sinking towards the ground without the least impediment,

OF THE MANNER OF HOLDING THE STAFF.

In the first stage of the operation, the staff is to be held by an assistant, who also raises the scrotum with his left hand, in order to let the surgeon have a complete view of the perineum. Some operators are anxious, that the convexity of the instrument should project distinctly in the perineum, for which purpose the assistant is usually desired to hold the handle perpendicularly to the trunk of the patient, and to propel the whole staff gently towards the part, where the operator means to make the first incision into it. The generality of surgeons, who attach much importance to this projection of the convexity of the staff in the perineum, have the instrument held straight, that is to say, with the handle neither inclined to the right, nor left. Other operators, however, take a different mode of determining the situation for the first incision, as will be hereafter explained, and prefer fixing the position of the staff, not with any view of making it project in the perineum, but on the following principles, as laid down by Langenbeck. His directions are given, however, on the supposition, that the operation is to be completed with a scalpel.

1. After the membranous portion of the urethra has been opened, the incision should be made laterally through the prostate gland.

* Klein, lib. cit. p. 30.

† *Über eine einfache und sichere Methode des Steinschnittes, &c.* p. 42.

2. Care should be taken to avoid injuring the vesiculæ seminales.

3. It is to be recollected, that the rectum is closely attached to the prostate gland by means of cellular substance.

When these things are considered, says Langenbeck, it must be evident how much will depend upon the position of the staff, and a right judgment may be formed of the manner in which it ought to be held.

1. The handle should be inclined towards the patient's right thigh; a method long ago preferred by the celebrated Cheselden.

2. At the same time, the assistant ought to turn forwards that edge of the handle, which faced the left thigh. By this manœuvre, the end of the instrument in the bladder will be turned sideways and a little downwards, and there will not be the least risk of wounding either the caput gallinaginis, the vas deferens, the vesiculæ seminales, or the rectum.

3. Lastly; the handle of the staff must be depressed towards the ground, whereby its end will be removed further from the prostate and neck of the bladder more deeply into the latter viscus. This precaution is highly necessary, when the staff is shortish, and its point not much curved. If the operation is to be completed with a knife, the staff, when put in the foregoing position, is to be committed to the charge of the assistant, who is to hold it so during the rest of the proceedings. * The difference of Cheselden's mode of holding the staff from Langenbeck's plan was, that the former did not turn the groove so completely to the left as the latter, while the concavity was drawn up close to the os pubis, in order to remove the urethra as far as possible from the rectum. No doubt, Langenbeck's directions are excellent, when the incisions are to be done altogether with a knife; or until the surgeon takes the gorget in his hand. † But, when the latter

* Langenbeck über eine einfache und sichere Methode des Steinschnittes, &c. p. 47.

† It may be asked, why in the lateral operation are the incisions made on the left side, in preference to the right? The only reason for the practice is, because the other side would not be convenient, except for such operators as happen to be left-handed. Under particular circumstances, however, Dubois and Klein have occasionally cut on the right side of the perineum and neck of the bladder. But, nobody has praised this method as the best in ordinary cases, except Rheineck, who urges as the motive for his choice the chance of wounding the rectum, which naturally inclines rather more towards the left, than the right edge of the sacrum. See Med. und Chir. Betrachtungen über die einfache Methode des Seiten-Blasenschnittes mit Mursinna's Vorrede.

instrument is to be introduced with its edge directed obliquely downwards and outwards to the mid-point between the tuberosity of the left ischium and the anus, the beak will certainly pass more securely if the groove of the staff be rather inclined to the right side of the perineum by moving its handle at the moment a little towards the left groin, as used to be the custom of Desault.* The common plan of holding the staff quite straight, with its handle perpendicular to the patient's body, and its convexity prominent in the perineum, may be considered unobjectionable, while the surgeon is making the external incisions, and until he proceeds to lay open the membranous part of the urethra. When this is to be done, the groove of the staff should be turned a little to the left side of the perineum; and afterwards when the prostate gland and neck of the bladder are to be cut with the gorget downwards and outwards, it will unquestionably be safest to incline the handle of the staff a little towards the left groin, while it is also brought forwards. At this period of employing the gorget, the staff must also be held by the operator himself; for, otherwise he loses the advantage of feeling in the best way whether the two instruments are properly in contact — whether the beak of the gorget is passing securely within the groove of the staff. In completing the operation with a knife, however, I believe with Langenbeck, that the assistant ought to hold the staff the whole time in the position, which that author has advised, because now there is no perilous thrust of the gorget to be encountered, and when once the staff is well placed, the operator may safely continue the division of the parts under the united guidance of the groove of that instrument, the index-finger of his left hand, his own eyes, and his own anatomical knowledge, which is the most essential of all requisites in this branch of surgery.

OF THE EXTERNAL INCISION.

The position of the staff having been arranged according as the intention may be to employ a gorget, or not, the surgeon is to sit down in a low chair, and proceed as follows: —

1. He is to feel for the arch of the pubes.
2. He is to trace with his finger the descending ramus of

* “ L'inclinaison légère du cathéter à gauche, à l'instant de l'introduction du gorgeret, donne au chirurgien la facilité de diriger la lame de celui-ci de telle manière, qu'elle se trouve exactement parallèle à l'incision extérieure.” See *Œuvres Chirurgicales de Desault par Bichat*, tom. ii. p. 469.

the pubes, the ascending ramus of the ischium, and the tuberosity of the latter bone.

3. When he has plainly distinguished these parts, he is to fancy to himself a line, beginning one inch below the arch of the pubes, running down at the distance of a finger-breadth from the rami of the pubes and ischium, and terminating between the anus and tuberosity of the last-mentioned bone. On this line, the surgeon is to make the first incision through the integuments with one sweep of the knife, while doing which, he is to place the fingers of his left hand on the right side of the nates, and make the skin of the perineum tense with the thumb. *

From what Langenbeck remarks, however, in the next page of his book, it appears, that he considers one inch and a half below the arch of the pubes the most eligible place for the commencement of the incision, as there will then be no risk of wounding the bulb of the urethra, which does not extend lower than an inch below the arch. In a boy eight years of age, he begins the incision one finger breadth above the anus, and half a finger-breadth from the ascending ramus of the ischium. In an adult, he recommends the cut to begin two finger-breadths above the anus, and to be carried down at half that distance from the ramus of the ischium. † As far as my own judgment extends, the beginning of the incision in a full-grown person should never be more than an inch and a half at most above the anus, as laying open a greater extent of the membranous part of the urethra towards the bulb, can have no more effect in facilitating the extraction of a stone from the bladder, than if the whole urethra were divided. When the external incision is made too high up, considerable disadvantage arises; for, when the operator begins in this way, and extends the wound the usual length, and divides with his scalpel the fat, transversales muscles, ligamentous fibres, and membranous part of the urethra, and then with his gorget makes the division of the prostate gland and neck of the bladder, he finds, upon attempting to take out the stone, that the external part of the wound is too high up, in regard to the opening in the bladder, and the same impediment to the extraction of the calculus is produced, as if the wound were too small. It is my decided belief, that, in the operation of lithotomy, a free and direct opening for the passage of the stone

* Langenbeck, vol. cit. p. 49.

† See his *Neue Bibliothek für die Chirurgie und Ophthalmologie*, b. i. p. 437. 12mo. Hannover, 1818.

ought always to be made; and that the fatal termination of numerous cases is entirely owing to the neglect of this important rule; because when the wound is too small, the greatest difficulty is experienced in getting out the stone, the forceps are introduced again and again; the bladder is seriously bruised and injured, the patient is kept a long time upon the operating table, and, if a further use of the knife be not made, or the stone broken (a very unpleasant circumstance), the extraction either will not be accomplished at all, or not without violent laceration of parts, which ought to have been simply divided. Hence, inflammation of the bladder and peritoneum is brought on; the most alarming and fatal consequence of lithotomy.

For these reasons, and others, which I have * elsewhere more fully explained, I am of opinion, that the incision in the skin should never commence higher up than an inch, or an inch and a half, above the anus, at the exact point where the operator means to make his first cut into the groove of the staff; and the wound in a full-grown person is to extend about three inches obliquely downwards to the left side of the raphe of the perineum. As it is also now a maxim with the best surgeons to make the direction of both the inner and outer wound correspond, I think there is an advantage in carrying the cut through the skin somewhat more towards the extreme internal point of the tuberosity of the ischium, than the midway between that bony prominence and the anus, as usually recommended. For, by cutting as much laterally as the safety of the pudendal artery will allow us, we avoid all chance of wounding, in the progress of the operation, the caput gallinæ, the seminal duct, and the rectum.

Having made the necessary division of the integuments, the next object is to dissect through the fat and cellular membrane, cut through the transversales perinæi muscles, and make an opening through the membranous part of the urethra, into the groove of the staff.

OF CUTTING INTO THE MEMBRANOUS PART OF THE URETHRA.

From what has been said, the reader will already understand, that, in this stage of the operation, the groove of the staff ought to be turned towards the left side of the perineum, downwards and outwards, and perhaps even somewhat more laterally, when it is intended to complete the opening into the

* See Medico-Chir. Trans. vol. viii. p. 206, &c.

bladder altogether with a knife: the reader is also apprized, that the principal thing here to be avoided, is cutting the bulb of the urethra, endangering the *arteria profunda penis*, and opening the membranous part of that canal too high up. I have now, therefore, very little to add upon this part of the subject. Of course, before the surgeon ventures to cut into the groove of the staff, he ought to feel the edges of the instrument very distinctly with his left fore-finger. It is also safest to begin to lay open the membranous part of the urethra at what may be regarded as the anterior point of the opening out of which the stone is to pass, and not further back towards the prostate gland. As soon as a small incision has been made into the groove of the staff, with the edge of the knife turned upwards and inwards, the operator, guided by the same groove and his left fore-finger, is to extend the cut back, as far as the prostate gland, through the rest of the membranous part of the urethra, taking care always to keep the edge of the scalpel turned in the same direction upwards and inwards towards the groove of the staff.

Some operators place the back of the extremity of the knife in the groove of the staff, and then lay open the urethra as far as the prostate, with the edge directed downwards and outwards. Either of these methods is perfectly safe, provided the staff be sufficiently large, and its groove wide and deep enough, as ought always to be the case. In dissecting down to the membranous part of the urethra, and in laying it open, as well as in cutting deeply towards the prostate, the surgeon must never cut with the edge of the knife imprudently directed too much downwards, because he would thereby inevitably wound the lower part of the rectum; and the same caution is still more necessary in dividing the prostate gland.

When the preceding instructions are duly observed, very little remains to be done with the gorget.

OF THE GORGET, AND MANNER OF USING IT.

Every operator should be particularly careful, that the beak of the gorget is accurately adapted to the groove of the staff. As far as my humble judgment extends, the gorget ought not to have its edge turned upwards, as advised by Mr. Abernethy, and Professor Scarpa.* By cutting in this direction, the pudendal artery must be more apt to be wounded, than when the incision is directed outwards and downwards,

* See his Memoir on Hawkins's Gorget, translated by Briggs.

towards the mid-point between the anus and the tuberosity of the ischium, as practised by Desault; because the rami of the ischium, on the inside of which the common pudendal arteries run, converge as they ascend; and, for the same reason, by using a gorget with an edge turned upwards, the wound can hardly be made large enough for the extraction of stones of considerable size. The impossibility also of making, with such an instrument, the incision in the neck of the bladder and prostate in the same direction as the oblique external wound, is another weighty objection to it. As Langenbeck correctly remarks, it is difficult to conceive how the pudendal artery can ever escape, when Cline's gorget is employed, the edge of which cuts directly towards that vessel. Fortunately, says he, the artery lies very close to the bone, and under an aponeurosis. * The direction of the edge of the gorget upwards and outwards must be still worse.

When a gorget is made to cut outwards and downwards, in the manner above recommended, a longer cutting edge can be employed, without any risk of wounding the pudendal artery, because the incision in that direction cannot reach that vessel at all. Thus, the operator, by becoming enabled to employ with safety a gorget with a longer sharp edge, has an instrument better calculated for making a sufficient opening into the bladder, for the easy passage of the stone, and one of the principal objections to gorgets in general is at all events lessened, if not entirely removed.

The experienced Desault made a variety of improvements in Hawkins's gorget: one in particular appears to me to merit adoption: it is that of making the direction of the handle not deviate so considerably from the axis of the rest of the instrument, as it commonly does. The lateral direction of the handle of Hawkins's gorget is extremely objectionable; for it prevents the operator from pushing the instrument along the staff, with half the convenience and security which are experienced in employing a gorget improved by the foregoing alteration.

Desault also very properly objected to the concave edge of the old gorgets, since it caused them to make an incision in the neck of the bladder and prostate, attended with a semi-circular flap above, which was apt to swell and obstruct the exit of the urine. He likewise censured the bad custom of having gorgets constructed with a long beak, by which the

* *Über eine einfache und sichere Methode des Steinschnittes*, p. 67. Klein wounded the pudendal artery, by using Cline's gorget. See *Chirurgische Bemerkungen*, p. 15.

opposite side of the bladder was liable to be injured, and even pierced, so as to give rise to an extravasation of urine of the most perilous kind, because its situation was inaccessible. *

Having made a free opening into the urethra, as low down as can be conveniently done, the operator is to place the beak of the gorget in the groove of the staff, and, being sure that this is accomplished, he is to take hold of the handle of the latter instrument with his left hand, while with his right, he holds the beak of the gorget carefully applied to the groove of the staff, along which it is to glide into the bladder. But, before pushing the gorget onward, a most important thing is to be observed; this is, to bring the handle of the staff considerably more forwards, than a perpendicular line to the trunk, and thus to elevate the beak of the instrument, by which means the gorget may be introduced, along the groove of the staff, more in the direction of the axis of the bladder. In fact, the gorget should be introduced, as nearly as the curvature of the staff will admit, in the direction of a line drawn from the os coccygis to the umbilicus, its beak being carefully kept in the groove of the staff. When this plan is followed, the gorget can never wound the rectum, nor insinuate itself into the cellular substance between this intestine and the bladder. For the purpose of making the gorget more easily cut in a direction corresponding to that of the outer wound, Desault used always, just at the moment of introducing the latter instrument, to incline the handle of the staff a little to the left, at the same time bringing it more forwards, for reasons already explained.

OF THE FORCEPS.

When the gorget has been introduced, the staff is to be withdrawn, and a proper pair of forceps passed along the gorget into the bladder, for the purpose of seizing, and extracting the stone. The forceps used formerly to be thicker, and of a more clumsy construction, than at present: the inside of the blades was also frequently furnished with little spikes, intended to keep the stone from slipping. These spikes were exceedingly objectionable; first, because they often made the calculus break before it was out of the bladder; and, secondly, because, as a modern surgeon has well observed, those situated towards the back part of the blades, when the stone happened to be grasped there, had the effect of increasing the expansion of the instrument so considerably, that it could

* See *Œuvres Chirurg. de Desault*, tom. ii. p. 460.

not be drawn out.* In addition to such reasons against having little spikes or teeth in common stone-forceps, I may mention their ill effect in preventing the stone, when it is grasped with its long axis transverse to the wound, from turning, as the forceps are drawn out, into a better position. However, though teeth are not to be commended, the inside of the blades ought unquestionably to be made somewhat rough. While the operator is passing the forceps along the gorget, the latter instrument must be kept quite motionless, lest its sharp edge do mischief; and immediately the forceps is in the bladder, the cutting gorget is to be withdrawn.

It is even questionable, whether it would not be better always to withdraw the gorget, as soon as the incision is completed. Very good surgeons are of opinion, that when a wound of proper size is made in the above direction, there never can be any difficulty in passing the forceps into the bladder, without the guidance of the gorget, which, however, may be safely employed for this purpose, if it be held steadily, with its edge directed downwards and outwards towards the lower angle of the wound. Formerly, it was the custom to withdraw the cutting gorget before the staff was taken out, and substitute, as a conductor for the forceps, a blunt gorget. The latter instrument, however, is now completely exploded; being found to be unnecessary, as the forceps will always pass through the wound, quite as easily as any blunt gorget can possibly do.

The next object is to take hold of the stone with the blades of the forceps, and if possible to grasp its smallest diameter. In order to accomplish this purpose, the operator should not expand the instrument as soon as it has arrived in the bladder; but, he should make use of the instrument as a kind of probe, for first ascertaining the exact situation of the stone. If this body should be lodged at the lower part of the bladder, just behind the neck of the viscus, and be distinctly felt below the blades of the forceps, the operator is to open the instrument immediately over the stone, and after depressing the blades a little, is to shut them, so as to grasp it. Certainly, it is much more scientific to imitate Cheselden, and use the forceps, at first, merely to ascertain the position of the stone; for, when this is known, the operator is far more able to grasp the extraneous body, in a skilful manner, than if he were to open the blades of the instrument immediately, without knowing where they ought next to be placed, or when shut. No man

* Langenbeck über eine einfache und sichere Methode des Steinschnittes, p. 43.

can doubt, that the injury which the bladder frequently suffers, from reiterated and awkward movements of the forceps, is not an uncommon cause of the inflammation of this organ, and of the abdominal viscera, often terminating in death.

If the calculus cannot be readily felt with the forceps, this instrument should not be roughly moved about, so as to bruise the bladder, and put the patient to insufferable agony; but, it should be taken out, and the fore-finger gently introduced, with which the situation of the calculus may generally be distinctly felt. Having a more correct idea of its situation and position, the surgeon will now know better how to proceed in getting it out with the forceps.

When the stone is found to be so large, that it cannot be extracted from the wound without violence and laceration, the surgeon may either break the stone with Mr. Earle's instrument *, or with a strong pair of screw forceps, furnished with teeth for the purpose; or he may enlarge the wound with a common scalpel, or a probe-pointed curved bistoury, introduced under the guidance of the fore-finger of the left-hand.

To the employment of the knife in this circumstance, I must express my decided preference. Breaking the stone in the bladder, is always an exceedingly unpleasant occurrence, as it creates such a chance of calculous fragments being left behind, and consequently of a return of the disorder.

When the stone, however, exceeds certain dimensions, the operator ought, undoubtedly, rather to endeavour to break it, than employ unwarrantable force for its extraction. †

When this has been done, and as many of the broken pieces have been taken out as the forceps or scoop will serve for removing, the surgeon is to introduce his finger, in order

* As this gentleman has made some considerable improvements in his stone-breaker, which he intends to explain to the profession himself, I have omitted in this edition the plate of the original form of the instrument.

† When a stone is of enormous size, and evidently cannot be sufficiently broken, without too tedious and irritating a process, I think the high operation should be preferred; because, above the os pubis there is much more room for the extraction of a very large calculus, than under the arch of that bone. Let not the inexperienced practitioner fancy, however, that any calculus can be got out above the pubes; for, stones have sometimes been so enormously large as to fill the bladder, and not to admit of being taken out even from the dead subject, without vast difficulty and violence. The reader will find the high operation described in the Dictionary: with respect to the modification of it practised by Dr. Souberbielle, (see Carpue's History of the High Operation, &c. Lond. 1819.) I cannot say, that it appears to me deserving of introduction. The objections to it, I shall probably consider at some future period.

to feel, whether any fragments still remain behind. If they do so, and from their smallness cannot be readily taken out, his best plan is to inject lukewarm water, with moderate force, for the purpose of washing them out of the bladder.

The operator ought always to examine a stone, as soon as it is extracted: if its whole surface be rough, it is a presumptive sign, that it is the only one; if it should be smooth on one side, and rough on the other, or excavated at any surface, there may probably be other stones. But, in every instance, the surgeon should introduce his fore-finger, in order to obtain decisive information on this point; for, it would be unpardonable to put the patient to bed while another stone remains in his bladder.

Sometimes, stones in the bladder cannot be grasped with the forceps, unless first raised by the index finger of the left-hand, introduced within the rectum.

OF COMPLETING THE INCISION INTO THE BLADDER WITH A KNIFE INSTEAD OF A GORGET.

The many disastrous accidents, which occasionally result from the employment of gorgets, have induced some very judicious surgeons to prefer finishing the operation with a knife, or, at all events, some kind of cutting instrument, not forcibly and suddenly thrust into the bladder, like a common gorget, with a risk of slipping away from the staff, and doing the most fatal mischief. From mistakes and unskilfulness in this part of the operation, I have known the urethra to be entirely severed from the bladder, and the patient, after suffering excruciating torture upon the operating table, die from the injury done, with the stone unextracted, the bladder not having even been opened. I have known the gorget slip in several instances between the bladder and rectum, and the patients lose their lives with the stone unremoved. I have seen patients opened after this operation, in whom the gorget had dreadfully injured the opposite side of the bladder. I recollect other cases, in which the gorget slipped up between the bladder and pubes, and, of course, the calculus never had an opening made for its extraction. In more than one example, have I known the rectum cut more than the bladder. Now, when it is further considered, that besides such mischief, arising from the slipping or unskilful use of a well-made gorget, a broad, badly constructed one, may cut the pudendal artery, it must be confessed, that there is great cause for wishing that lithotomy could always be done with an instrument attended with fewer dangers.

According to Klein, than whom few have written more sensibly on lithotomy, that method of operating must be accounted the most advantageous, in which the surgeon is best enabled to make with certainty the right kind of incision, that is to say, in which the opening in the bladder may be made larger, or smaller, as may be judged requisite; in which also the fewest instruments are needed; the least irritation produced; the operation most expeditiously done; and in which, the instruments will serve for every age and sex, and for all cases, whether the stone be large or small. Of all the many instruments which have been especially devised for lithotomy, not one possesses these desirable qualities. As is well known, a common scalpel is the only instrument possessing such recommendations, and with it, the operation can be most perfectly executed. Unfortunately, however, instead of laudable endeavours to bring the knife more generally into use, we see every now and then new gorgets invented, as if these thoroughly useless instruments were absolutely indispensable.

The gorget, says Klein, as a conductor for the forceps, is entirely unnecessary; for, how repeatedly do we see the latter instrument introduced in the course of an operation, under the guidance of the finger, without any assistance from a gorget? And, as the latter means is sometimes dispensed with, as a conductor, why should it not always be so? But, as a cutting instrument, it is not only not essential, but decidedly objectionable; for, in every instance, it makes the wound of a determinate size, whatever may be the dimensions of the stone to be extracted. Frequently, the incision is too small, the stone cannot be drawn out, and the operation cannot be directly completed; an inconvenience, which may be so easily avoided. When these manifest defects are considered, it must appear, that the operation is rather impeded, than facilitated, by the employment of a cutting gorget. Every man who has operated upon the living subject, must know, how apt one is to lose the cut in the urethra from the slightest movement of the patient, how difficult it then is to find the groove of the staff with the beak of the gorget, and how very liable, under these circumstances, the latter is to deviate altogether from the staff. Thus the operation becomes unnecessarily lengthened; one is sometimes obliged to make new incisions into the urethra, greater irritation than ought to happen is produced, and the slipping of the gorget off the staff makes false passages, which are frequently of serious consequence. That all these inconveniences often take place, Klein considers the continual changes made in the construction of the beaks of gorgets an ample proof; and he urges, that the defects of the latter instru-

ments must be still more frequently exemplified in the practice of young operators. The finger, says he, is clearly the best conductor, and he regards the very use of a gorget, as a mark of the apprehension with which the operation is undertaken.*

A good example was long ago set us by Le Dran, Cheselden, and Schmucker, all of whom successfully performed lithotomy with a common scalpel; and, amongst modern surgeons, none have been more zealous opposers of the gorget-practice than Mr. John Bell†, Klein, and Langenbeck.

From the observations already delivered in explanation of lithotomy with a gorget, the reader will understand how to proceed in the operation with other cutting instruments, as far as the period, when the side of the prostate gland and the neck of the bladder are the only parts remaining to be divided; for, until this moment, every thing is done nearly in the same way, whether a gorget is to be afterwards employed, or not.

Cheselden, after cutting the fat rather deeply, especially near the rectum, used to put his left fore-finger into the wound, and keep it there till the internal incision was quite finished; first, to direct the point of his knife into the groove of the staff, which he now felt with the end of his finger; and secondly, to hold down the rectum, and keep it from being wounded. The internal incision was then made by cutting into the groove of the staff, through the side of the bladder, immediately above the prostate, and afterwards continuing the point of the knife along the same groove downwards and forwards, so as to divide the portion of the sphincter of the bladder lying upon the prostate, and then the outside of the gland itself obliquely, in the direction of the urethra within it, the requisite division of which, however, was made the last part of the business.

Mr. John Bell's method of operating with a knife is not materially different from the preceding, and needs no particular description. His brother, Mr. Charles Bell, rather imitates one of Cheselden's first methods by cutting first into the staff, and then running the knife along the groove of the staff, into the bladder, followed by the left fore-finger. This is to remain, the knife to be withdrawn, and the forceps introduced under the direction of the finger. The chief pecu-

* Chirurgische Bemerkungen von Chr. Klein, p. 3—6. 12mo. Stuttgart, 1801.

† See his Principles of Surgery.

liarity in the latter gentleman's method is the use of a staff, grooved on the right side. *

Klein considers it immaterial whether the groove of the staff be turned obliquely downwards, or to the left: he says, however, that as far as his own experience goes, the knife is less apt to slip when the groove is downwards, which may then be more readily found and entered with the knife.

The same surgeon thinks the shape of the knife a matter of indifference: every long bistoury—every scalpel will do equally well. He observes, however, that it must be longish, (with the handle about eight English inches in length,) have a convex-edged blade about an inch and a quarter long †, and five lines broad; a straight strong back; and be very firmly fixed in the handle. ‡

Klein has given the most exact account, which I have been able to find, of the method of operating with a knife: the following are the instructions delivered by him.

After the rectum has been emptied with a clyster, a dose of opium administered, the patient properly bound upon the table, and in adults the hair shaven off the perineum, the staff is to be introduced. In this constrained position, it is often difficult to pass the latter instrument, which therefore should be previously introduced, or else it will become necessary to unfasten the ligatures. The scrotum is to be held up by an assistant, who is to hold the convexity of the staff obliquely towards the left side, and closely pressed against the perineum. This assistant, who ought always to be the most skilful one at hand, is to keep the staff exactly in the position above recommended.

The operator should be so seated as to have his breast on a level with the patient's perineum; he is to notice well the direction of the ascending ramus of the ischium; stretch the perineum towards the right side with his left hand, and with such a knife as is above recommended, he is to make an incision at least three inches long through the skin and muscles. This cut is to extend from the middle of the perineum, obliquely towards the left side, between the anus and ischium, running parallel to the ramus of the latter bone, at the distance of one finger-breadth from it. With his left fore-finger, the surgeon is now to feel for the groove of the staff, and cut completely through the muscles towards it, making the wound

* See C. Bell's *Operative Surgery*, vol. i.

† I apprehend the French measure is here understood.

‡ *Chirurgische Bemerkungen*, p. 31, 32.

in the same direction as the first incision. The operator is to remember, however, that he is never to cut straight forwards, (into the patient as it were,) but obliquely upwards towards the axis of the symphysis of the pubes, and never in the middle of the external wound, but at its upper angle. By this second cut, he will either get into the groove of the staff; or, at all events, be enabled to feel it very plainly, in which case, the point of the knife, guided by the finger, is now to be pushed into the groove, directly behind the symphysis of the pubes *, through the left side of the urethra, and the knife is then to be carried a little way forwards along the groove, in order to divide some of the membranous part of the urethra. But cutting precisely in this manner, it will be impossible to wound either the rectum, or the bulb of the urethra: the first part never, because the incision is directed upwards, not downwards; and, with regard to the last, it is not at all endangered in the foregoing way of laying open the urethra, as it is situated exactly under the symphysis of the pubes, and on this side of the incision into the urethra. Besides, says Klein, it may always be pressed with the finger to one side. †

The knife being placed in the groove of the staff, the surgeon is to take the latter instrument from the assistant, bring its handle somewhat more towards himself, so as to elevate its point, while he presses its concavity close up against the ossa pubis, partly to increase the tension of the urethra, and partly to let the instrument rest upon a fixed point, the groove still continuing to be directed to the left side.

Now the knife is to divide the membranous part of the urethra, and the prostate gland; which is the part of the operation requiring the greatest care. *In every case*, says Klein, *the blade must be so directed as to bring its surface in a parallel line to the ascending ramus of the ischium, with the edge towards the lower angle of the external wound, and never towards the ischium.* It is next to be considered, whether on account of the magnitude of the stone, or the patient's age, the incision

* Klein cuts higher up than Langenbeck directs, or than appears to me advantageous. How far the highest part of the incision ought to be below the arch of the pubes I have explained in a foregoing section.

† Klein thought an injury of the bulb of the urethra a matter of no importance, and in itself I believe it is so; but, by cutting so high up as to expose it at all to be wounded, is disadvantageous on other accounts. First; because the external wound is then too high up, in relation to the opening, through which the calculus must pass out of the bladder. Secondly, because laying open all the membranous part of the urethra is completely unnecessary. And, lastly, because cutting about the bulb, as Langenbeck has correctly pointed out, endangers the arteria profunda penis.

should be large, or small. In the latter case, the back of the scalpel must be kept close in the groove of the staff; but, in the former, it must be more or less separated from the groove, according to the extent to be given to the incision. The distance can only be well calculated by practice; but, a failure will never attend even the first trial, for when any uncertainty prevails, it is always best to keep the back of the knife nearer the groove, and make a smaller cut, which, if necessary, may afterwards be easily enlarged.

Until now the knife is to be held like a pen, and the cut through the prostate gland might be performed in the same manner; but, as its division requires more force than the parts previously cut, Klein thinks it better to grasp the handle of the knife with the whole hand. The scalpel being now securely held in the right direction, and the sound firmly kept in the proper position with the left hand, the first instrument is to be boldly and quickly carried straight along the groove of the staff, the edge freeing the way for its passage. The point of the knife is constantly to remain in the groove, and is to be pushed on, either until it touches the closed part of the staff, or the want of resistance denotes its being within the bladder. Every operator, says Klein, knows the length of the end of his staff, and he is so to arrange it, as only to make it project a little way into the bladder, in which circumstance, he will soon get to the closure of the groove with the knife. But, if the handle of the staff should happen to be too much forwards, and its point raised too far in the bladder, the knife must then be pushed on in adults about an inch and a quarter, and in children about three-quarters of an inch, by which means the membranous portion of the urethra, and the prostate gland, will be divided: the latter part, however, sometimes not entirely, the incision being yet smaller than it ought to be. In a later work, Klein informs us, that, when he is raising the handle of the knife in withdrawing it, he always takes that opportunity of dilating the incision in the bladder from within outwards, and the whole wound now has, instead of a triangular, a quadrangular form. "I thus (says he) combine the effect of a gorget with that of the bistoure caché. I open the bladder, as the knife is pushed on, and enlarge the opening as the instrument is withdrawn." *

The knife and staff having been withdrawn, the left fore-

* *Practische Ansichten der bedeutendsten Chirurgischen Operationen auf eigene Erfahrungen gegründet von D. C. Klein, p. 23. 4to. Stuttgart, 1816.*

finger is to be introduced through the wound into the bladder, in order to feel, whether the opening is large enough; *and it should always be large enough to let the stone easily pass out, without the least necessity for any violent pulling, which must inevitably occasion a serious degree of contusion.* The more readily the stone comes out, the more speedy is the cure. Le Cat, and also Scarpa *, have written about the advantages of a small incision, the dangers of a free opening, and the little harm of dilatation. But, says Klein, "I entertain quite the opposite opinion, and consider a free incision as most likely to bring about an expeditious and a perfect cure." In following the above directions, the incision will never be made too large, nor can it happen, unless the knife be separated too far from the staff. Neither will the pudendal artery, nor any other part which ought to be avoided, be injured, as the edge of the knife, directed as above, never cuts towards the ischium, but at a certain distance from, and in a parallel line to it.

Should the wound be found large enough for the extraction of the stone, the forceps is to be introduced under the guidance of the finger, and the calculus taken out.

But, if the opening appear too small, (a circumstance often first observable on attempting to draw out the stone,) the left fore-finger is to be passed into the bladder, and (under its direction and with the point not projecting beyond it) the knife is to be again carried into the bladder, in its former position. The prostate gland is then to be completely divided, care being taken always to cut obliquely downwards to the left. If requisite, the incision is also to be carried on through a part of the bladder itself, in doing which, the operator must cut only with the further part of the knife, pressed on with the finger. Thus, the incision may be made as large as necessary, without any risk, and the rectum can never be hurt with the flat surface of the blade.

In a work of more recent date, Klein lays down, as the basis of his method, the necessity of always dividing not only the prostate gland completely through, but also a portion of the bladder itself. Upon this basis, (says he,) rests the success of my operations, and hence I invariably make it a rule, rather to make the incision too large, than too small, and never to dilate it with any blunt instrument, when it happens to be too diminutive, but to enlarge it with a knife, introduced, if necessary, several times. †

* Memoir on Hawkins's Cutting Gorget.

† *Practische Ansichten der bedeutendsten Chirurgischen Operationen*, p. 27.

The next thing is to search for the stone with the forceps, the blades of which are to be oiled, and introduced into the bladder in the axis of the pelvis. Klein says, he has often got in the forceps, without any preliminary introduction of the finger. The instrument should be passed in the direction of the wound, with its sides turned towards the angles of the incision. The stone is now to be felt for, the position of which has in general been already ascertained by the finger, and it is commonly soon discovered, when the forceps is cautiously moved about in various directions. An endeavour is now to be made to extract it by the smallest diameter, in regulating which object the fore-finger will be of assistance. The extraction should be done very slowly, and always in a direction towards the floor (or rather downwards, outwards, and forwards, according to the axis of the wound). The stone should also be drawn out, with a wriggling motion, between the lips of the wound, and not towards its angles, where the parts are less yielding, and an unnecessary degree of contusion would be produced.

In general, says Klein, when the wound is properly made, the stone may be taken out with great readiness and facility, as very large stones are less frequent. When these are met with, much turning of them and a great deal of trouble are usually necessary. The search for the stone, and its extraction, are the most painful part of the operation, and from the instant that the calculus is out, the patient's sufferings are at an end.

Another motive, judiciously urged by Klein, for making a free opening, is being able to extract soft stones unbroken, which is much better than having to take them out piecemeal, and repeatedly to introduce the instruments. He owns, that it is generally difficult to ascertain beforehand the soft consistence of a stone; yet, says he, when much sand-like matter is discharged with the urine, and the stone, when hit with a metallic instrument, makes no very distinct sound, a suspicion of its softness may be entertained, and, in this case, it is most prudent not only to make a large opening, but to avoid grasping the calculus too firmly with the forceps.

However, if the stone break, the largest fragments must be taken away partly with the finger, partly with the forceps or scoop, and partly by means of a lukewarm injection. The removal of every small particle, however, Klein considers unnecessary, as it is sure of being voided with the urine in the course of the first few days after the operation, and the repeated introduction of instruments would cause excessive irritation, put the patient in danger, produce fistulæ, or, at

all events, protract the cure. Fortunately, observes this author, soft stones are of less frequent occurrence than hard ones.

In every case, after the calculus is extracted, the finger, or a sound, should be passed into the bladder, in order to feel whether any other stone is remaining. Nothing certain about there being no other can be learned either from the shape, or smoothness of what is first taken out. Klein tells us, he extracted one calculus, which was perfectly smooth on one side, yet single; Warner himself took out two rough stones, and in December, 1752, he saw ten rough calculi, which had been extracted after death from the bladder of an old man, the largest of which weighed eight ounces and a half, while the others were small.* Walter also found six stones, one of which was very angular.†

As soon as the calculi and fragments have been removed, the patient is to be unbound. A pledget dipped in oil is laid upon the wound, and supported with a compress, and T bandage. The knees are loosely confined together with a napkin, and the patient is carefully made to lie upon his side with the thighs and knees considerably bent. The first day, Klein lets his patient drink freely of such beverages as barley-water, and afterwards of lemonade. An opiate is administered as soon as the patient is put to bed; and on the second day, the bowels are to be opened with a clyster, or a gentle purgative. When the wound has suppured, it is dressed with dry lint, and Klein says, he never finds any other application requisite, except sometimes a little caustic towards the end of the case.‡ In proof of the success of his method, he tells us, that in 1816 he had cut into the bladder seventy-nine times (for he almost always cut more or less of that viscus), and not one patient had died, unless where the prostate, bladder, kidneys, or ureters were diseased. Notwithstanding the free division of the bladder, most of the patients got well in from eight to fourteen days; a few in a month; and one alone was three months in recovering. Though the sphincter of the bladder was divided, no paralysis of it was the result. Except when the calculi were large, or something unusual happened, the operation was also completed in thirty seconds, or a minute.§

* See Warner's Cases in Surgery, p. 248—250. edit. 4.

† Mus. Anat. p. 68.

‡ See Klein's Chirurgische Bemerkungen, p. 37—48.

§ Practische Ansichten der bedeutendsten Operationen, p. 28, 29.

OF LANGENBECK'S LITHOTOMY KNIFE.

Professor Langenbeck adopts many of Klein's sentiments concerning the principles of this important operation; but he differs on one point, which is of consequence. He is of opinion, that the wound should be made at once of an adequate size; and not be made at first small, and afterwards enlarged, according to the size of the stone. While Klein thinks almost any scalpel will serve for making an opening into the bladder, and uses himself only a common bistoury, about seven inches in length, Langenbeck prefers a larger and broader knife, the point of which admits of having a sliding guard pushed over it at the period when it is to be introduced along the groove of the staff. This excellent surgeon thinks the edge ought to be convex; for, if the knife be straight, the incision, if made from without inwards, will be too small; or, this inconvenience can only be in some measure hindered by making the lithotomy knife form a considerable angle with the staff; that is to say, by letting merely the point of the knife touch the latter instrument, while its back is considerably separated. When the angle between the staff and the knife is great, the broad part of the blade, Langenbeck conceives, is carried too near the pudendal artery.* A convex-edged knife always forms a larger incision, without any occasion for making so considerable an angle. He recommends the blade to be one inch three lines long, and three-quarters of an inch in breadth.†

With such a knife, Langenbeck assures us, the incision will neither be too large, nor too small, but always of sufficient size for the easy extraction of the stone, without any subsequent dilatation. Cheselden's knife he considers faulty, inasmuch as the convex-edged blade is too short and small. For similar reasons, he also disapproves of Klein's scalpel, the convex-edged blade of which is only an inch and a quarter long, and five lines broad. The incision, when performed with such a knife, from without inwards, will always be too small. Langenbeck says that he has operated on the dead subject both with Cheselden's and Klein's knife, and always found this to be the case. Klein himself, indeed, relates instances, in which he was obliged to enlarge the wound with

* This can never happen, however, when the knife is directed as Klein recommends.

† I cannot reconcile this description with the size of the knife engraved in Langenbeck's work: the plate, I imagine, shows the proper dimensions,

the knife guided by his finger; and while he represents, as the principal advantage of his method, the power which it affords the operator of making the opening in the bladder small or large according to circumstances, he assures us, that the dilatation of the wound with the knife guided by the finger is easy and free from danger.

In opposition to this statement, however, Langenbeck urges the following arguments.

In no case is it a desideratum of any simple method of lithotomy to make the incision small or large at the surgeon's option. It is a principle, that does not at all tend to simplify the operation, but, on the contrary, must render it more difficult and complicated, especially in the hands of the inexperienced. It is better and more simple to make the requisite opening for the extraction of the stone with one, instead of two incisions; and, consequently, a knife should be chosen, which will invariably make the wound large enough*, without going beyond the limits of safety.

Langenbeck next argues, that it is dangerous to enlarge the wound with the knife under the guidance of the finger. The direction of the first incision is easily lost, and the surgeon is apt to cut towards the trigonum, instead of laterally, as Klein in one instance appears to have done himself; for, says Langenbeck in this case, the accident must be ascribed to the enlargement of the wound with the knife guided on the finger, because Klein could never have cut towards the trigonum, while he held the staff with its groove directed obliquely downwards and outwards. In dilating the wound with the knife, guided by the finger, Langenbeck conceives also, that there is risk of wounding the caput gallinaginis, the rectum, and the vesiculæ seminales. Langenbeck demands what use the staff can be of at all, unless we are convinced, that without this instrument, there is danger of injuring important parts? If it were really easy to imitate Klein, and make the lateral incision with the knife, guided by the finger, the staff would be of no use but in the division of the membranous part of the urethra, and afterwards it might be withdrawn, and the wound dilated on the finger. But, the truth is, that the staff is of

* As the size of the stone can never be exactly known beforehand, it must be rather vague to talk of *always* making the incision large enough at once for its extraction. In many cases this would be impracticable, and the attempt often lead the surgeon to make a wound two or three times as large as necessary. See Klein's Observations in Loder's Journ. vol. iv. p. 235, and his Pract. Ansichten der bedeutensten Operationen, 2tes Heft, 4to. Stuttgart, 1816.

the highest utility, when the prostate gland is to be divided *; and at this period of the operation, the safety of the important parts will very much depend upon the groove of the staff being turned to the left side.

Hence, Langenbeck would not adopt Klein's method of enlarging the wound, but, if one dilatation were requisite, he would always try to give the staff its original direction, and then use the knife guided by it.

Every surgeon must agree with Langenbeck, that a lithotomy knife should have a good point. †

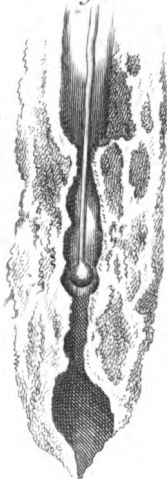
In cutting into the groove of the staff, the membranous part of the urethra is to be opened at some distance behind the bulb: hence, the surgeon must not cut straight forwards, or inwards with respect to the patient; but depress the handle of the knife, and direct the point obliquely upwards towards the axis of the pubes. How necessary here a good point is for this manœuvre must be sufficiently obvious; for, the operator cannot go on with the incision until he has first made a puncture.

These reflections led Langenbeck to have his lithotomy knife constructed with a sliding guard for the point. The guard, he says, is of essential use in facilitating the conveyance of the knife, along the groove of the staff, because, if an attempt be made to push the knife forwards on its point, it will pass along with great difficulty, as the point will stick and hitch in the groove. This will happen in the greatest degree, when the staff has been already used in several previous operations. But, a lithotomy knife, which has its point guarded by a small

* By reference to the foregoing section of this chapter, the reader will perceive that Langenbeck has not represented Klein's advice quite fairly; for the latter always used the staff in dividing the prostate, and perhaps on the whole, attaches as much importance to the instrument as Langenbeck himself. For my own part, as the direction of the outer wound corresponds to that of the inner one, I cannot understand, what difficulty there can be in enlarging the latter, provided the left fore-finger will pass into the bladder as a guide.

† In reply to these observations, Klein says, that they are contradicted by his experience both on the living and dead subjects, in which, after several dilatations had been made, the incision, when carefully inspected, was always found to have the same appearance as if it had been a single cut. He argues also, as I think, with reason, that the attempt, with the aid of the staff introduced again to make the direction of the incisions correspond more certainly to the first, than they could be likely to do without it, is a scheme not presenting any prospect of really lessening the imagined risk of a deviation of the knife, and that though in this way the bladder might not be cut, the staff could not in the least contribute to the safety of the rectum, the vesiculæ seminales, &c. *Practische Ansichten der bedeutendsten Operationen*, p. 31, 4to. Würzburg, 1816.

Fig. 1.



*M^r C. Bell's balls for
examining Strictures.*

Fig. 2.

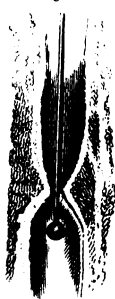


Fig. 3.



Fig. 4.

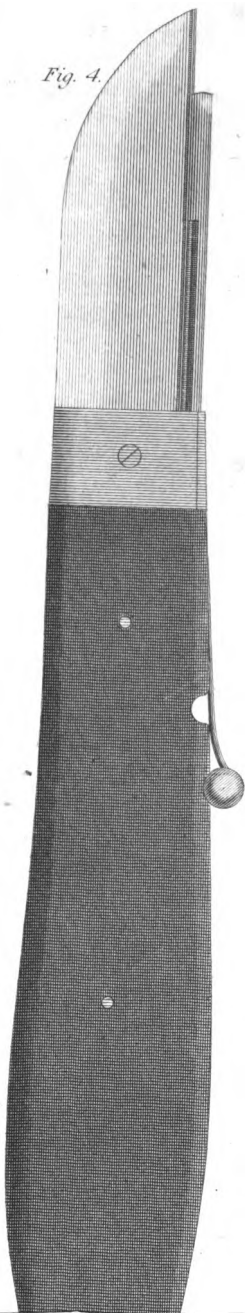


Fig. 5.

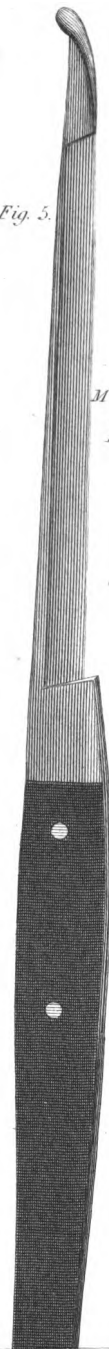
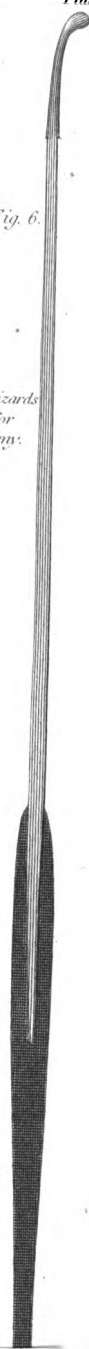


Fig. 6.



*M^r Tho^s Blizard's
Knife for
Lithotomy.*

button, slips very readily along the groove of the staff. In fact, every surgeon knows, that in laying open a sinus, a probe-pointed bistoury will always glide along the groove of a director more readily than one which is sharp-pointed.

In lithotomy, the sliding guard * is the more essential, as the knife must be pressed firmly into the groove of the staff; and, without such a contrivance, its point would be apt to break, when it reached the termination of the groove.

Langenbeck recommends the handle of the knife not to be too light, as, when of a certain weight, it feels more convenient in the hand.

The handle is also to be long, so that the knife can be easily pushed as far as the end of the staff.

The blade of Langenbeck's lithotomy knife is exactly the same as that proposed by Weidmann; but, in order to give the instrument due length, the former surgeon fixes this blade in a similar handle to that of Monro's knife, by which means, the instrument attains the length of eight inches, and is very convenient for use. †

Weidmann's knife, when turned round after its introduction into the bladder, served likewise as a conductor for the forceps; but, as this turning of the instrument is liable to wound the bladder, Hesselbach was induced to annex to the blade a guard, which admitted of being pushed forwards so as to cover its edge, after the incision had been made. But, Langenbeck considers every conductor for the forceps superfluous, as the latter instrument will always very readily follow the finger into the bladder: therefore, he has not contrived his lithotomy knife for answering such purpose.

* The construction of Langenbeck's knife, and the nature of the sliding guard for the point, when this is to be pressed into the groove of the staff, will be sufficiently intelligible by a reference to plate 16, fig. 3 and 4. The instrument there represented is calculated for an adult: a smaller one was used on a boy eight years old. See his *Neue Bibliothek für die Chirurgie*, b. i. p. 431.

† As there is some difficulty in comprehending the exact dimensions of Langenbeck's knife, on account of the inches in Germany being different from those in England, I measured the engraving of the instrument for an adult, as represented in his book. From the point to the end of the handle $8\frac{1}{2}$ inches; length of the blade rather better than two inches; greatest breadth $\frac{1}{2}$ of an inch.

INVALIDITY OF THE REASONS ASSIGNED FOR SOMETIMES DEFERRING THE EXTRACTION OF THE STONE, AFTER THE OPENING HAS BEEN MADE IN THE BLADDER.

Klein offers his sentiments upon a question, that has been sometimes agitated, whether a calculus should always be taken out directly an opening has been made in the bladder, or not till a few days have passed, or left to come out of itself? He affirms, that he knows of no case, in which the postponement of the extraction can be advantageous. The sight of the stone, after it is taken out, is a great satisfaction to the patient. The obstacle to extraction mostly depends upon the wound having been made with a gorget, and therefore too small, in relation to the size of the stone, and upon the operator not having presence of mind enough to enlarge the opening with a knife. Hence, arose the absurd custom of sometimes leaving the calculus unextracted, while effectual assistance might have been afforded without any delay, or keeping the patient in a state of uncertainty for several days, or weeks. The size of the stone, says Klein, is no reason for such practice; for, if the calculus were known beforehand to be too large for extraction through the perineum, the high operation would be the proper method. Calculi of extraordinary magnitude, however, have been got out of the bladder below the pubes without any bad effects, the incision having been made large enough, and the surgeon not prematurely intimidated. Klein himself extracted by the lateral operation, done with a knife, a stone which weighed without the fragments six-and-twenty ounces thirty grains, was three French inches nine lines in length, at one end two inches six lines in its transverse diameter, and at the other three inches nine lines; with a perpendicular diameter of three quarters of an inch.* When a calculus is large, it evidently can never come of itself out of an inadequate opening in the bladder; and, as Klein very properly remarks, it is no argument to the contrary, that cases, like Sabatier's, may be adduced†, where a stone, weighing nine ounces, which had not been extracted at the time of the operation, was spontaneously discharged on the following day. Had the spasm been previously removed, this stone might unquestionably have been taken out at once; for the wound

* *Chirurgische Bemerkungen*, p. 106. When a stone is of this size, many surgeons would prefer breaking to extracting it whole.

† See Fourcroy's *Médecine Eclairée*, tom. iii.

must certainly have been large enough, or else the calculus could not have passed out on the following day.

With respect to the spasmodic contraction of the bladder, as a reason for dividing the operation into two stages, with so long an interval between them, it is not valid, as when an opiate has been given, a few minutes will suffice for its subsidence. Neither will Klein admit, that the adhesion, or rather encysted state of the calculus, is any exception, as the foreign body may always be got out with Desault's coupe-bride, or any other scalpel.

An injury of the pudendal artery ought never to make the surgeon defer the extraction of the stone. *

OF WOUNDS OF THE RECTUM.

Unless the operator cut very carelessly, and turn the edge of the knife directly downwards, instead of obliquely sideways, the rectum cannot be injured. With a gorget, however, there is really more danger of such an accident, when the instrument slips out of the groove of the staff. Also, when the rectum is distended with feces, it is more exposed to injury; but, why should the surgeon ever operate without having previously emptied that intestine? † But, if the accident were to happen, I think with Klein, that Desault's advice immediately to divide the rest of the gut down to the anus is entirely erroneous, as numerous instances have proved, that the wound may heal up very well, without any thing of this kind being done. I know of a recent example, in which the rectum was wounded with a lithotomy knife; but the cut in the bowel healed up of itself, and never gave any trouble.

OF WOUNDS OF THE PUDENDAL ARTERY.

No doubt, some of the profuse bleedings, which have taken place in lithotomy, have not proceeded from the pudendal artery itself, but either from the arteria profunda penis, when the incision was made too high up, or, in other cases, from the trunk of the perineal artery. I am surprised, however, that M. Roux ‡ should assert, that, in directing the incision too far laterally, there is no risk at all of wounding the pudendal

* Chir. Bemerkungen, p. 34, 35.

† Ibid. p. 6.

‡ Relation d'un Voyage fait à Londres en 1814; ou Parallèle de la Chirurgie Angloise avec la Chirurgie Française, p. 322. 8vo. Lond. 1815.

artery. This is an observation which is entirely erroneous, and might encourage the admirers of broad long-edged gorgets to persevere with their instruments, until they had learned from experience, that lithotomy can never be done with safety, unless the incision be made, not only of sufficient size, but in a proper direction. Klein informs us, that he has twice had the ill luck to wound the trunk of the pudendal artery; the first instance was in a child four years of age; the hemorrhage was suppressed by introducing into the wound a piece of sponge, which was removed on the fifth day: the part was healed in a fortnight, but, for nine weeks, an incontinence of urine continued; an occurrence, which Klein imputes to the pressure of the sponge.* The second case happened in a patient twenty-six years of age, from cutting too much sideways with Cline's gorget. A most profuse hemorrhage instantly ensued; but the operator, without suffering himself to be alarmed, proceeded immediately to the extraction of the stone, which was difficult of removal, on account of its large size. During the protracted endeavours to get it out, a prodigious quantity of bright red arterial blood was lost; the patient grew pale; and his pulse was sinking. Klein therefore deemed it necessary to try to take up the artery without further delay; but he was quite unable to discover its throbbing by making pressure at every point of what he thought likely to be its situation. In the mean while, the hemorrhage could not be checked by pressure tried in every direction. The impossibility of tying the artery being evident, what was to be done? Klein first filled the whole cavity of the wound with a piece of sponge, dipped in brandy, and thus succeeded in putting a stop to the bleeding. The question now came, whether he should extract the stone immediately, or not till after a few days. The first plan was decided upon, and the sponge withdrawn, when the blood gushed out as profusely as at first. With a great deal of trouble, the stone was at last got out. The wound was then distended with a linen tent and a piece of sponge; and the patient was kept quiet on the operating table twenty-four hours, during which time, the assistants relieved each other alternately in making pressure on the wound. Klein reckons, that this patient lost four pounds of blood in the operation; his pulse was exceedingly feeble, and rapid; his countenance cadaverously pale; and his strength so much reduced, that the greatest fears were entertained for his life. In the end, however, he got completely

* Chirurgische Bemerkungen, p. 11.

well, and had not the slightest infirmity as a consequence of the operation.

Klein finishes his comment upon the foregoing case, with recommending surgeons not to think of trying to tie the trunk of the pudendal artery, when it happens to be wounded, but immediately to fill the wound with sponge.* Even if it were practicable to tie this artery, it would not be advisable, previously to the extraction of the stone, the passage of which outwards would inevitably force the ligature off the vessel again.†

OF INFLAMMATION WITHIN THE ABDOMEN AFTER THE OPERATION.

The majority of patients, who die in consequence of lithotomy, perish of peritoneal inflammation. Hence, on the occurrence of any tenderness, pain, and tension over the abdomen, with great restlessness, thirst, heat of the skin, and a small quick pulse, copious venesection should be put in practice. At the same time, eight or ten leeches should be applied to the hypogastric region. The feebleness of the pulse should not deter the practitioner from using the lancet; this symptom is only fallacious; and is attendant on all inflammation within the abdomen. Together with the above measures, the warm bath, fomentations, blisters, the exhibition of the oleum ricini, and the employment of emollient clysters, are highly proper.

I have seen several old subjects die of the irritation of a diseased, thickened state of the bladder, continuing after the stone had been extracted. They had not the acute symptoms, the inflammatory fever, the general tenderness, and tension of the abdomen, as in cases of peritonitis, they referred their uneasiness to the lower part of the pelvis; and, instead of dying in the course of two or three days, as those usually do who perish of peritoneal inflammation, they, for the most part, lingered for two or three weeks after the operation. In these cases, opiate clysters, and blistering the hypogastric region, are proper.

In some instances of this kind, collections of matter form in the vicinity of the neck of the bladder.‡

* The sponge should have a cannula passed through it, for the easy evacuation of the urine. Both Klein and Langenbeck recommend this method. See C. J. M. Langenbeck über eine einfache und sichere Methode des Steinschnittes, p. 58. 4to. Würzburg, 1802.

† Klein, Op. cit. p. 12—21.

‡ In Italy, Nannoni and Flajani have for some years past performed

CHAPTER XXXVI.

OF SPINA BIFIDA, OR HYDRORACHITIS.

SPINA BIFIDA is a swelling situated on the spines of infants, commonly on the lumbar vertebræ, occasionally on the dorsal, or cervical ones, and sometimes, though less frequently, on the os sacrum: it is filled with a limpid fluid, and arises from an imperfection of the bones, and a protrusion of the membranous lining of the spinal canal.

A tumour of a similar nature is sometimes seen on the head. *

In spina bifida, the swelling is soft, and gradually diminishes, or even quite disappears on pressure; but, the tumour returns immediately the pressure is removed. The fluctuation of a fluid is distinctly perceptible to the touch. The integuments retain their natural colour and appearance. However, the children seem to experience pain, when the tumour is compressed, or when they are placed on their backs. The size of the swelling is very various. I have seen one, situated on the sacrum of a healthy looking child, about a year and a half old, which was larger than its head †; in general, they seldom exceed the size of an orange.

The generality of children affected with spina bifida, are deficient in strength and vigour, and are subject to frequent diarrhœa. Some cannot retain their urine and feces. A weakness and emaciation are often particularly observable in

lithotomy nearly in the same manner as Klein. In England, the knife has been preferred to the gorget by a large number of the best modern surgeons, some of whom, however, appear yet to be reluctant to abandon gorgets altogether. Mr. Thomas Blizard employed a particular knife for lithotomy. (See plate 16. figs. 5 and 6.) So did the late Mr. Gibson, whose instrument may be seen at any of the shops. Mr. A. Cooper has sometimes operated with a convex-edged dissecting knife, made with a beak, by means of which it admits of being guided along the groove of the staff. Every knife for lithotomy should be with the handle seven or eight inches long; for, otherwise, it will not conveniently execute the deeper part of the incision in a fat subject. Whoever is acquainted with the anatomy of the parts, and has considered the right principles of the operation, as laid down by John Bell, Klein, and Langenbeck will be able to cut a patient for the stone, with almost any kind of knife. Langenbeck's appears to me as good an instrument as can be chosen; and the sliding guard for its point equally useful and simple. For an account of various other methods of cutting for the stone, I must refer to the Dictionary.

* See Richter's Chirurg. Bibliothek, 9 band, p. 186.

† This case was shown to me by my friend Mr. Maul, an eminent surgeon at Southampton.

the lower extremities, which, indeed, are sometimes almost paralytic. Though most children agree with this account, some are, in every respect, except the tumour, perfectly healthy, and well formed.

The swelling consists of a sac, filled with an aqueous fluid; and composed of the integuments, and of the membranous sheath, which lines the canal for the spinal marrow. The lining of the spinal canal protrudes through a fissure in the vertebræ. This fissure is owing to an imperfect formation of these bones, and is commonly found at their posterior part, where the spinous processes would otherwise be. The preternatural opening is sometimes confined to one bone, and then the swelling often has a small base. In many instances, several vertebræ have not their ossification completed behind, so that the canal for the spinal marrow resembles an open furrow. Even the whole spine, from one end to the other, has been found thus imperfect.* The aperture has been known to extend through the body of the affected vertebræ, so that the finger could be passed quite into the abdomen.† In one example, there was not only a furrow in the vertebræ, but all the processes of these bones were wanting.‡

The sac is commonly filled with a clear, transparent fluid; but, occasionally, it is turbid, yellowish, and bloody. The portion of the spinal marrow, surrounded by the fluid, is generally softened, and almost like mucus, or thin matter.§

Children afflicted with this disease, sometimes suffer, at the same time, from hydrocephalus. They seldom live longer than a year after birth. The tumour generally continues to enlarge. Occasionally, it inflames and ulcerates, and then death very soon follows. Children are observed to live longest, when the swelling is remote from the head. The instances of persons attaining a middle age with this disorder are rare, and they have mostly had their lower extremities in a paralytic, useless state. A few examples are recorded, however, in which the patients lived to the ages of eight, seventeen ||, twenty ¶, and fifty.**

* Maret, *Mémoires de Dijon*, vol. ii. p. 105.

† Saltzmann, *De Tumoribus quibusdam Serosis Externis*.

‡ Richter's *Chirurg. Bibl.* 4 b. 2 st. p. 350.

§ *Mémoires de l'Acad. de Dijon*, vol. ii., and Richter's *Anfangsgr der Wundarzneykunst*, band. 2. p. 236.; Dritte Auflage.

|| Acrell, *K. Vetenskaps Ac. Hædligar*, 1748, p. 91.

¶ Warner's *Cases in Surgery*, p. 136. edit. 4.

** Hochstaetter, *Diss. de Spina Bifida*, Altorf, 1703.

TREATMENT OF SPINA BIFIDA.

Experience has fully proved, that puncturing the tumour with a lancet, and thus discharging the fluid, either at once, or gradually, cannot be done without putting the patient in the greatest danger, the consequences being for the most part fatal in a very short space of time. Also, when the swelling ulcerates, and bursts of itself, the child perishes; nor, has tying the pedicles of such spinæ bifidæ, as have narrow bases, proved more successful. Some years ago, Mr. Abernethy suggested the method of letting out the fluid, of closing and healing the puncture immediately afterwards, and repeating the same proceedings, as often as necessary.* This gentleman tried the plan in one instance, and, though it was not attended with ultimate success, it did not seem to bring on the sudden fatal symptoms, which are the usual effects of letting out the fluid in the common way.

This last proposal, which originated with Mr. Abernethy, is highly important, inasmuch as subsequent operations have proved, that a practice, founded on the foregoing principles, may actually effect a cure of certain forms of a disease, that, until very lately, always baffled the art of surgery. It is to Mr. Astley Cooper, that we are indebted for some new attempts to cure the present disease: he tried the effect of puncturing spinæ bifidæ with a fine pointed needle, instead of a lancet, letting out the fluid from time to time, and promoting a closure of the opening in the spine by applying a compress and bandage. When this practice answers, the adhesive inflammation obliterates the cavity, in which the fluid was collected, and the disease ultimately does not return. In one case, Mr. Astley Cooper seems thus to have accomplished a perfect cure.†

This excellent surgeon, however, pursues two modes of treatment, for the relief of children afflicted with spinæ bifidæ; one palliative; the other, radical.

The first consists in treating the case as a hernia, and applying a truss to prevent its descent: the second, in pricking the tumour with a fine needle, and producing adhesion of the sides of the sac, so as to close the opening in the spine, and stop the disease altogether. The first is attended with no risk; the second exposes the patient to much constitutional

* See Abernethy's Surgical and Physiological Essays, part 1 and 5.

† See Medico-Chirurgical Transactions, vol. ii. case 2. p. 326.

irritation; but, if successful, hinders the future recurrence of the disease. Even when the adhesive process cannot be effectually accomplished by the first plan, the second, or palliative method, may yet be tried. *

There are numerous cases of *spinæ bifidæ*, however, which leave no hope of cure. The following examples of this description are pointed out by Mr. Astley Cooper.

If the tumour is connected with an unnatural enlargement of the head, *hydrocephalus internus* is conjoined with *spina bifida*; and whether the radical, or palliative treatment of the tumour on the back be tried, the water will accumulate in the ventricles.

If the lower extremities are paralytic, or the feces and urine are discharged involuntarily, there is no hope of relief.

If the tumour has burst at the time of birth, or soon afterwards, little expectation of a cure can be indulged; for, although the opening in the skin may be closed with lint and adhesive plaster, and union be produced, so that no more of the fluid can escape, yet, *hydrocephalus internus* will follow.

The deficiency of the spine is sometimes so great, that the tumour, at the time of the child's birth, is very considerable; the nerves are protruded out of the spinal canal; the spinal marrow is injured; and all attempts at a cure must be unavailing. †

In this disease, purgatives and diuretics have been tried in vain; and no outward applications, excepting pressure, have been found to do the least good. Richter has suggested making two issues near the tumour‡; but, I do not know, that the proposal brings with it much promise of utility. In short, in the present state of our knowledge, the practice tried by Mr. Astley Cooper, is the only one, in favour of which facts and actual experience can be adduced; and, if we except the cases brought forward by this gentleman, we have no instance on record of a *spina bifida* being cured, or benefited.

When the disease does not admit of the radical, or palliative cure, the surgeon should instruct the friends of the patient to keep the tumour out of the way of every thing that has a tendency to make it inflame and ulcerate; and, if any thing at all be done, the swelling should be tenderly bathed, every now and then, with spirituous and mildly astringent lotions, with a view of averting inflammation and ulceration of the skin.

* See Case 4. lib. cit.

† A. Cooper, lib. cit.

‡ Anfangsgr. dcr Wundarzneykunst, band 2. p. 240.

CHAPTER XXXVII.

AMPUTATION.

CASES sometimes present themselves, in which the certainty of death authorizes treatment, which too often leaves only a probability of life. Such are all those external diseases, which, placing the patient betwixt the danger of his condition, and the risk of a great operation, leave him no other resource, but that of exposing himself to the latter, in order to avoid the former; and of this nature, in particular, are those cases, in which the preservation of life depends upon the removal of a limb. But, here, perhaps, more than in any other case, the wise surgeon will generally be slow in resorting to the knife. Amputation is an extreme measure, which frequently has an unfortunate result; and, as success itself is only obtainable by a terrible sacrifice, we are bound by every principle of surgery and humanity never to practise the operation, before every other possible means of relief has been fairly tried, and found to be ineffectual.*

As an excellent surgeon † has observed, the removal of a limb is to be regarded as a melancholy proof, that surgery, as well as every other art and science, is still imperfect: and the surgeon, when he undertakes this operation, makes a plain confession, that his utmost skill has failed to cure the disease. Fortunately for mankind, since the great progress, which modern surgery has made in the art of curing external diseases, the number of cases, in which the removal of a limb is indispensably necessary, has been considerably lessened. The absolute necessity for amputation, however, is yet universally admitted in examples in which the limb is very badly shattered, or crushed, a joint entirely destroyed by caries, the principal blood-vessels injured, and the flesh also badly wounded, or the substance of the limb deeply affected with gangrene, or some species of incurable tumour, attended with serious inconvenience, great pain, and alarming derangement of the health. If then amputation cannot be entirely dispensed with, it must be rendering

* "L'art est ici presque toujours meurtrier, quand il veut trop tôt devenir salulaire." *Œuvres Chir. de Desault*, par Bichat, tom. ii. p. 531.

† Just. Chr. Loder, in *Chirurgisch-Medicinische Beobachtungen*, Erstes Cap. 8vo. Weimar, 1794.

an important service to suffering humanity to take every possible means of shortening this dreadful operation, of lessening the agony proceeding from it, and of expediting the healing of the stump. In order duly to appreciate the nature of this service, says Loder, we should recollect the barbarous proceedings exemplified in former times, when surgeons used to stop bleeding with the application of boiling water, hot oil, melted sulphur or lead; or by using a heated knife; while others effected the separation of the part by one stroke of a machine, which sadly bruised and lacerated the flesh. While surgery was in this deplorable state, it is no wonder, that most patients refused to submit to treatment, which was more dreadful than death itself; and that many good and even courageous surgeons shrunk from the performance of a grievous operation scarcely ever successful.

The ligation of the vessels, the tourniquet, the double incision, and the method of amputating with a flap, as Loder correctly remarks, are amongst the principal inventions, by which this operation has been brought to its present state of perfection; but, none of the moderns have done more for the improvement of amputation than Mr. Alanson, whose excellent work * cannot be too strongly recommended. He simplified the operation, and facilitated and abridged the after-treatment, making it almost impossible for others (as Loder conceived) to suggest any thing else of importance on the same subject. Before Mr. Alanson's time, the cure of a stump was usually not completed in less than five or six months, during all which time the patient was in continual danger of falling a victim to immoderate suppuration. But by that gentleman's method the cure was effected in the short space of three or four weeks, in the simplest manner, and with exemplary security, the tedious protrusion of the bone, which was formerly deemed almost unavoidable, being thereby entirely prevented. It has been erroneously imagined, that the essential part of Alanson's method consisted in cutting obliquely through the muscles with a single stroke of the knife. This is far from being the truth. The oblique division of the muscles, the high point at which the bone is sawn through, and the immediate closure of the wound, are the things, which gave his mode of practice its great advantages. It is true Alanson was not the inventor of all these improvements; but, he was undeniably the first who

* Practical Observations on Amputation, and the after-treatment: to which is added an account of the Amputation above the Ankle with a Flap, &c. 2d. Edit. 8vo. Lond. 1782.

put them all in practice together; and with respect to the oblique division of the muscles, this was peculiar to him. *

Amongst the improvers of this operation also must not be forgotten M. Louis, whose explanation of the advantage of dividing the loose muscles first, and afterwards those which are more fixed, has had very beneficial effects in practice.

Amputation is performed either in the continuity of a member, or at one of its articulations, each of which modes, however, cannot always be practised indifferently, the choice depending upon the situation, extent, and nature of the disease, or injury, for which the removal of the part becomes indispensable. In all amputations done at the joints, it is the general practice to make a flap of flesh for covering the end of the bone; but, when the operation is performed at another part of the limb, it is frequently at the option of the surgeon, whether the method adopted be *amputation with a flap*, or *amputation by a circular incision*. In all common instances, the latter practice receives the approbation of the majority of the best modern surgeons; but there are particular cases, in which a deviation from this mode, in favour of the flap operation, is commendable and useful, as I shall hereafter notice.

Before proceeding to the description of the methods of taking off limbs, let me just remind the reader of two lines, which convey a piece of general information of high value in this part of surgery, and constitute, as it were, one of the best fundamental rules for our guidance in the performance of amputation: "as little of the flesh should be cut away, as possible; but, the more bone is removed the better." †

AMPUTATION OF THE THIGH.

The thigh should be amputated as low as the disease will allow. The patient is to be placed on a firm table, with his back properly supported by pillows, and assistants, who are also to hold his hands, and keep him from moving too much during the operation. The ankle of the sound limb is to be fastened, by means of a garter, to the nearest leg of the table.

* The oblique division of the muscles, however, the first suggestion of which reflects such celebrity on the name of Mr. Alanson, is not at present universally approved of, when done exactly in the way directed by that author, as I shall presently notice.

† "On doit couper des chairs le moins qu'il est possible, et des os, le plus qu'on peut." J. L. Petit, *Traité des Maladies Chirurgicales*, tom. iii. p. 150.

TOURNIQUET.

The first thing is the application of the tourniquet. The pad of this instrument should be placed exactly over the femoral artery, in as high a situation as can conveniently be done. When the thigh is to be amputated very far up, a tourniquet is inconvenient, and, in this case, an assistant is to compress the femoral artery in the groin by any commodious instrument, having a round, blunt end, adapted for making direct pressure on the vessel, without injuring the integuments.

Perhaps, however, the latter method should only be adopted when the operation is to be done so high up, that the tourniquet would absolutely be in the way of the incisions. It is generally acknowledged, that some disadvantage results from the application of the tourniquet to a thigh, on which amputation is practised, because the instrument tends to obstruct the full retraction of the muscles as soon as they are divided. Yet, in ordinary cases, it is by no means advisable to prefer compression of the femoral artery in the groin by an assistant to the employment of a tourniquet. Putting out of present consideration, his being liable to fail in regularly commanding the flow of blood through the artery, on account of the violent struggling of the patient, we are to remember, that besides this vessel, there are others concerned in supplying the thigh with blood, which are branches of the internal iliac, and come out of the lower openings of the pelvis; as, for instance, the arteria obturatoria, the iliaca posterior, or glutea, and the ischiadica. Hence, pressure upon the femoral artery in the groin can never stop the bleeding, but incompletely; and I leave it to every man of experience to contemplate, how many cases there are, in which not a drop of blood should be unnecessarily spilt. I would even urge, that, in numerous instances, in which the patient is much reduced at the time of submitting to the operation, any considerable hemorrhage must be regarded as a fatal occurrence. A tourniquet, made on the principle of a truss, has been suggested; but it would also have no effect in checking the bleeding from such arterial branches, as emerge from the apertures of the pelvis. Unless, therefore, the height of the requisite incisions leave no convenient room for the instrument, the use of the common tourniquet should not be relinquished: it makes pressure on the whole circumference of the limb; it can be tightened, or loosened, with the greatest celerity, as circumstances may require; and it operates without risk of displacement.* On the other hand,

* In Klein's *Practische Ansichten der bedeutendsten Chirurgischen Operationen*, 1stes. Heft. p. 64, &c. may be found a description of a new

it has the inconvenience of opposing the full retraction of the superficial loose muscles, before those more fixed to the bone are cut; but I must still think with Pelletan, that it is an inconvenience, to which we ought to submit. *

FIRST INCISION.

The operator is to stand on the right side of the patient, whether the right or left limb is to be removed. By this means, he acquires the advantage of always having his left hand next the wound, so as to be of very essential assistance. This advantage more than counterbalances the inconvenience of having the right limb in the way of the operator, when the left thigh is that which is to be amputated.

An assistant, firmly grasping the thigh with both hands, is to draw upward the skin and muscles with some force, while the surgeon makes a circular incision, as quickly as possible, through the integuments, down to the muscles. When the integuments are sound in the place of the incision and above it, their retraction by the assistant as soon as they are cut through, and a very slight division of the bands of cellular substance with the edge of the amputating knife towards the point, will generally preserve a sufficient quantity for covering, in conjunction with the muscles cut in a mode about to be described, the extremity of the bone; and the painful method of dissecting up the skin from the fascia, and turning it back, previously to dividing the muscles, may be considered useless and improper in all amputations of the thigh, where the skin retains its natural moveableness and elasticity.

This practice of dissecting up and turning back about a couple of inches of the skin, in cutting off a thigh, has been censured by some of the first practical surgeons, which this

and ingenious kind of tourniquet, which he terms his compressorium. My limits will here only allow me just to say, that it is an instrument consisting of two longish, flat, thin, curved pieces of steel. These are connected together below by a joint, and within the concavity of that, which is to be applied over the side of the member, where the artery lies, is placed a sliding projecting pad. Above, a transverse piece of steel proceeds across from the highest point of one of the branches through an aperture at the top of the other. This transverse piece, when drawn through the opening, fixes the distance between the perpendicular branches, at the option of the surgeon. Klein affirms that this instrument has some advantages over the common tourniquet; but, they do not appear to me sufficiently important to require any particular comment. The instrument cannot be well understood, without the engravings, which may be seen in Klein's publication. The invention would be more important, if the common tourniquet were not already so excellent.

* See Clinique Chir. tom. iii. p. 230.

country ever produced. Thus it was disapproved of long ago by Bromfield; and even Alanson, who praised the method in the earliest edition of his book, thought proper afterwards, when further experience had brought his judgment to greater maturity, to deliver a very different sentiment upon the subject. From the example set me by some of the former surgeons of St. Bartholomew's-hospital, during my apprenticeship there, I also once fancied, that, in amputation of the thigh, a considerable dissection of the skin from the muscles, previously to the division of the latter, was a matter of absolute necessity. The experience, however, which I had in the course of the last two wars, soon produced in my mind a different conviction.

For some useful remarks on this point, the profession are indebted to Mr. Guthrie, who has explained, that, in primary amputations, or those done at an early period after the receipt of a gunshot injury, while the part of the limb, where the incisions are to be made, is in the natural state, and the skin loose and moveable, "it will be sufficient to touch the thread of membrane, or fascia adhering below, with the point of the same (the amputating) knife, to give ample covering for an excellent stump, without putting the patient to the torture of having his skin pinched, and dissected back, for the space of a couple of inches, for four or five minutes." This gentleman, at the same time, particularly insists on the utility of dividing the fascia and integuments together, by which means, the latter can be retracted much further, than would otherwise happen.

In operations, however, performed from the third to the twelfth day after the receipt of the wound, and near the injured parts, Mr. Guthrie admits the propriety of dissecting the integuments a little way up from the fascia, as in these cases the retraction, effected by the assistant and the natural elasticity of the skin, will not avail in saving enough of it to cover well the surface of the stump: yet, even here this gentleman rightly disapproves of turning back the separated integuments, as is often done, like the top of a glove.

In secondary amputations, (says he,) with the exception of those, in which the operation is required in parts actually unsound, the integuments may be sufficiently retracted, without any formal dissection of them from the subjacent fascia.*

Besides the objection to such dissection, on the ground of

* G. J. Guthrie on Gunshot Wounds of the Extremities, requiring the different operations of Amputation, with their after-treatment, &c. p. 84, 85. 8vo. Lond. 1815.

AMPUTATION.

the great agony which it excites, it should never be done unnecessarily on another account, particularly insisted upon by Loder, viz. because a redundancy of skin is apt to serve as a lodging place for matter, and be the means of preventing the thing, which is always particularly desirable, namely, union by the first intention. *

It is difficult to give any exact general rules for determining how much skin is to be saved. According to Loder, the less bulky the limb is, the less need the edge of the integuments project beyond the surface of the divided muscles; and the more fat there is, the greater must be the length of the preserved skin. In the first case, (says he,) about half an inch will be enough; in second, an inch, or more, will be requisite. The more obliquely the incision is made through the muscles, the less necessary will skin be for covering them afterwards, because their edge will be thin. But, in the opposite case, a larger piece of skin will be wanted for covering the bulky ends of the muscles. When the parts are sound above the place of the incision, the greater or lesser breadth of the projecting edge of the skin will always depend upon the retraction of it at the period of its division. If the assistant draw it back with force, more will be saved: and if it be drawn back but a little way, the part projecting beyond the edge of the muscles will be but small. The assistant, in drawing back the integuments, is to be particularly careful to do this evenly and smoothly all round the member, so that the skin may not be wrinkled, nor pulled up more in one place, than another. †

In the above description, I have said, that the surgeon is to begin the operation by making an incision through the skin all round the limb. The generality of surgeons, very rightly considering this as one of the most painful parts of the operation, do it with as much quickness as possible, and therefore carry the knife all round the member with one sweep, which is begun with the knife and hand which holds it, carried round under the limb, until the edge of the former can be placed perpendicularly on the skin covering the extensor muscles. Excepting the appearance of greater skill, and a

* Chirurgische-Medicinische Beobachtungen, p. 6. The above objections to the common mode of dissecting up the skin freely, and turning it back, must be limited to amputations of the thigh and upper-arm; for, in removing the lower extremity below the knee, the preservation of skin enough to cover well the tibia, and outer part of the stump, requires something more than drawing the integuments upwards at the period of their division.

† Loder, lib. cit. p. 7.

little greater quickness, however, the foregoing mode of dividing the skin all round the limb with one stroke of the knife, has no particular advantage over the method practised also by good operators, of completing the cut with two, instead of one sweep of the amputating knife.

OF DIVIDING THE MUSCLES.

The ancient surgeons used to cut directly down to the bone at once, and the frequent consequence was a very conical, or sugar-loaf stump, extremely unfit for bearing any degree of pressure, and, therefore, kept healed with difficulty. The end of the bone, in fact, was very often seen protruding beyond the soft parts. Hence, arose the necessity for endeavouring to improve the mode of operating; and, at length, the important amendment was introduced of cutting the integuments through first, and then the muscles. This method is well known amongst surgeons by the name of the *double incision*, the honour of suggesting which is claimed both by Cheselden and Petit.

But, notwithstanding the practice of the double incision enabled the surgeon to save skin, and saw the bone further above the cutaneous wound, than used formerly to be done, while it also diminished the frequency of a projection of the bone and conical stump, these evils were not entirely hindered, and further changes were indispensable. The great innovations, which ultimately proved nearly effectual in the prevention of such tedious miserable cases, were undoubtedly those measures, to which I have alluded at the beginning of this chapter, viz. in addition to the saving of skin, the oblique division of the muscles, suggested by Alanson, the cutting of the loose muscles first, and the fixed ones afterwards, proposed by Louis, and the immediate closure of the wound, after the bleeding had been stopped; the great utility of which last proceeding appears to have been first brought to light in the early trials of what are called flap-amputations.

M. Louis, a surgeon, for whose memory every admirer of surgical science ought to entertain sincere respect, was the first who discerned the principal cause of the projection of the bone. He observed, that the muscles of the thigh became retracted in an unequal manner, when divided; those which are superficial, and extend along the limb, more or less obliquely, without being attached to the bone, becoming retracted with greater force, than others, which are deep, and, in some measure, parallel to the axis of the femur, and fixed

to this bone throughout its whole length. Their retraction begins at the moment of the operation, and, for some time afterwards, continues unfinished. Hence, the effect should be promoted, and be as complete as possible, before the bone is sawn. With this view, M. Louis practised another kind of double incision; by the first, he cut, at the same time, both the integuments, and the loose superficial muscles; by the second, he divided those muscles, which are deep, and closely connected with the femur. On the first deep, circular cut being completed, M. Louis used to remove the band encircling the limb above the track of the knife, in order to allow the divided muscles to become retracted without any impediment, and he then cut the deep muscles, on a level with the surface of those which had been divided at first, and which were now in a retracted state. In this way, he could evidently saw the bone very high up, and the painful dissection of the skin from the muscles was avoided. I have always thought the reasoning of this eminent practitioner very strong, and his practice deserving of a more extensive trial than I believe it has obtained in this country. His truly interesting observations on this subject, particularly merit the attention of the operating surgeon. *

According to Mr. Alanson's account, his mode of amputating was as follows:—the integuments being divided by a circular wound, the knife is to be applied, close to the margin of the retracted skin, upon the inner edge of the vastus internus, and, at one stroke an incision is to be made obliquely through the muscles, upward in respect to the limb, and down to the bone: in other words, the cut is to be made in such a direction as to lay the bone bare, about two or three finger-breadths higher, than a perpendicular incision would do. The operator is now to draw the knife towards himself, so that its point may rest upon the bone, still observing to keep the instrument in the same oblique position, in order that the muscles may be divided all round the limb in that direction, by a proper turn of the knife. During the performance of this movement, the point of the knife is to be kept in contact with the bone, round which it of course must revolve. †

* See *Mémoire sur la saillie de l'os après l'Amputation des Membres; ou l'on examine les causes de cet inconvénient, les moyens d'y remédier, et ceux de la prévenir.* Also, *Second Mémoire sur l'Amputation des Membres, Mém. de l'Acad. de Chirurgie*, tom. v. p. 244., and 401., edit. in 12mo. Likewise, *Nouvelles Observations sur la Rétraction des Muscles après l'Amputation de la Cuisse, et sur les moyens de la prévenir.* *Op. cit.* tom. xi. p. 63. edit. in 12mo.

† See Alanson's *Practical Observations on Amputation*, 2d edition.

Many writers have objected to the difficulty of making the oblique incision exactly as Mr. Alanson has directed, and Mr. Hey even questions the possibility of the practice, without a different result from what Mr. Alanson intended. It is evident (says Mr. Hey) that a conical incision through the muscles of the thigh cannot be made with a continued stroke, in the usual mode of amputating. For, supposing the edge of the knife to have once penetrated obliquely through the muscles, so as to be an inch higher, when arrived at the bone, than when it penetrated the surface; if the incision be continued with a flowing stroke, the knife must then cut the surface of the undivided muscles an inch higher than at the commencement of the incision.* How far it is actually practicable to keep the point of the knife in contact with an exact circle on the bone, during the oblique passage of the instrument all round the member, it is not for me to say, because, seeing its difficulty, I have never attempted it; nor can I suppose, that Alanson himself ever really did what he literally recommends. Of one thing also I am sure, that I have seen many surgeons, in their attempt to do this business after Alanson's directions, get so high up as to cut the subjacent reflected skin.

The late Mr. Hey is not the only, nor the earliest writer, who has pointed out the inaccuracy of Mr. Alanson's own directions. Professor Richter has offered several judicious criticisms upon them, which perfectly coincide with Mr. Hey's views. It is remarked, that when the knife, with its edge turned obliquely upwards, has reached the bone, a flap is actually formed on the side where the incision is practised; and the edge of the knife is now three inches higher, than the cut in the skin. In this state, the surgeon cannot possibly continue the incision. The only thing which he can now do, is to place the knife on the opposite side of the thigh in the same manner, and make a flap there. The operation, says Richter, is then rather a flap-amputation, not done in the best way, than an operation really practised as Alanson thought possible. By following precisely this gentleman's instructions, Richter thinks it would be quite impracticable to form a hollow stump, though, he conceives, that the thing might perhaps be done by reiterated oblique strokes of the knife all round the limb. But, he exclaims, what a stump there would then be, and what a method of operating! He comments also on the difficulty of making a knife cut properly by mere pressure, as would be the case, were its point kept unremittingly against

* Hey's Practical Observations in Surgery, p. 529. edit. 2.

the bone, in carrying the incision round the member; on the preferable nature of amputation with a flap to this method, the wound left by which is longer in healing; and on the pain and delay of separating the skin to be saved, a proceeding altogether unneeded in amputating with a flap.* These observations are partly correct; but, they are to be regarded as coming from a surgeon, who was extremely partial to the flap-operation, and did not attach the proper value to the suggestion of making in a right manner the oblique division of the muscles.

I am happy to remark, that many excellent surgeons, whom I have seen operate, do not cut at once obliquely down to the bone, after the integuments have been retracted and divided; but so far adopt the principles of M. Louis, as to divide the loose muscles first, and lastly, those which are intimately attached to the bone, taking care completely to cut, with a scalpel, the deep muscular attachments, for about an inch higher up, than could be executed with the amputating knife itself. This last measure causes very little pain, and has immense effect in averting all possibility of a subsequent protrusion of the bone, or of a bad sugar-loaf-stump. Such used to be the practice of Mr. Hey, who calls it the *triple incision* †: and Mr. Guthrie ‡, in his account of amputation of the thigh, is a decided advocate for a very similar mode. In this method, however, the advantage of the oblique incision through the different layers of muscles was invariably retained. While I served in the army, I always endeavoured, in the performance of amputations, to combine, as far as circumstances would allow, the Alansonian principles with those of the eminent M. Louis. This is certainly a better mode of operating, than that, in which Mr. Alanson's directions are precisely followed. However, I am obliged to state, that the attempt to divide the loose muscles first, and then the more fixed ones, is apt to make a hasty surgeon cut the whole, or a great part of the same muscle through more than once; a fault in modern practice, which, as far as my judgment extends, deserves reprobation, as much as any proceeding which can be instanced. To say how unnecessary it is to divide any muscle more than once, is as needless as to remind the reader of its doubling the agony of a most severe operation.

In the descriptions of amputation, usually met with in

* Anfangsgr. der Wundarzn. b. vii. p. 187.

† Hey's Practical Observations in Surgery, p. 526. edit. 2.

‡ On Gunshot Wounds of the Extremities, &c. p. 86.

books, some pains are taken to expose the advantages of holding the limb in a half-bent position while the division of the muscles is going on, in order that the flexor and extensor muscles may be in an equal relaxation. This advice may be good, if it can be followed; and the plan of relaxing each set of muscles as much as possible, by a change in the posture of the member when they are about to be cut, as has been sometimes recommended, might be still more rational as being conducive to the preservation of a greater proportion of flesh. But, unfortunately, the operator, who begins to think of these projects when his patient is upon the table, generally finds them impracticable, the disease, or injury having already so fixed the posture of the member, that little or no deviation can be made, without the greatest difficulty and pain.

USE OF THE RETRACTOR.

Having cut completely down to the bone, a piece of linen, somewhat broader than the stump, should be torn at one end, along its middle part, to the extent of about eight or ten inches. This is called a retractor, and is applied by placing the exposed part of the bone in the slit, and drawing the ends of the linen upward on each side of the stump. Thus the retractor will evidently keep every part of the surface of the wound out of the way of the saw. I have seen the saw do so much mischief, in consequence of neglecting to use the retractor, that my conscience obliges me to censure such surgeons as are in the habit of employing the saw, without defending the soft parts by this simple contrivance. I think no one can say, that the retractor can do harm; and I know, that many who have been with myself eye-witnesses of the mischief frequently done by the saw in amputations, are deeply impressed with an aversion to the neglect of this bandage. I have often seen the soft parts skilfully divided; and I have, in the same instances, seen the operators directly afterwards lose all the praise, which every one was ready to bestow, by their literally sawing through one half of the ends of the muscles, together with the bone. But, besides defending the surface of the stump from the teeth of the saw, the retractor will undoubtedly enable the operator to saw the bone higher up, than he otherwise could do.*

* Petit earnestly recommends the employment of a linen retractor: when a surgeon once told him, that he did not use it, because the teeth of the saw were apt to get entangled in it, he answered: "*Il est vrai que*

OF SCRAPING THE BONE.

Another proceeding, which seems to be fit for reprobation, is the practice of scraping up the periosteum with the knife, as far as the muscles will allow. This is a sentiment, in which I must still continue to join the experienced and judicious Petit, notwithstanding a modern author * has actually devoted a section of his book to the praise of what is here particularly disapproved of. The chief argument for the practice urged by Brunninghausen, is, that, by scraping the periosteum upwards from the bone, a portion of the detached membrane will yet remain connected to the muscular fibres, thus pushed back, and afterwards admit of being brought down with them over the sawn bone. As, however, I have seen the bone extensively scraped, without an exfoliation being a regular effect of the method, I do not consider, as Petit did, that a part of the bone must *inevitably* die, after the periosteum is thus freely scraped away; but, I look upon the improper and useless separation of this membrane, as one of the circumstances which tend to produce the exfoliations, that sometimes happen after amputations. At all events, it is a superfluous, useless measure, as a sharp saw, such as ought to be employed, will never be impeded by so slender a membrane as the periosteum. † All that the operator ought to do, is to take care to cut completely down to the bone, round the whole of its circumference. Thus a circular division of the periosteum will be made, and here the saw should be placed.

In confirmation of the correctness of the foregoing advice, I beg leave to quote what Richter has said upon the subject of scraping the periosteum off the bone. The thin layers of flesh (says he) which, when the soft parts are drawn up, usually remain here and there upon the part of the bone about to be sawn, the surgeon should now cut carefully through with a scalpel, together with the periosteum, as high as pos-

cela peut arriver lorsqu'on ne sait pas le placer; les meilleures manières d'opérer ont leur inconvénient, si on néglige les circonstances qui les font réussir." *Traité des Maladies Chir.* t. iii. p. 152.

* H. J. Brunninghausen, *Erfahrungen und Bemerkungen über die Amputation*, p. 67. Bamberg, 1818.

† Petit's opinion is thus expressed: "Si par trop d'exactitude, on dépouille trop en avant les os de leur périoste, l'exfoliation, qui devient inévitable dans ce cas, se fait long-temps attendre, et retarde beaucoup la guérison: je préfère donc de scier le périoste avec les os; j'ai toujours éprouvé que cette méthode étoit moins douloureuse et qu'elle évitoit souvent l'exfoliation." Vol. cit. p. 158.

sible, and close to the slit in the retractor. It is quite unnecessary, he observes, to scrape away the periosteum from the place where the saw is to be applied. Neither this membrane, nor a few slender muscular fibres, can at all hinder the action of the saw, and, after the last sweep of the scalpel, are lifeless and insensible. Such scraping he considers also objectionable, on account of the delay which it produces. *

OF THE MANNER OF SAWING THE BONE.

As Petit justly remarks, this part of the operation is by no means easy to a person unaccustomed to handle a saw. The principal difficulty arises from the bone being sawn up in the air (as it were); at least, the part is in general but very imperfectly fixed by two persons, who, however strong they may be, cannot resist the saw, and hinder the limb from being shaken, whereby the direction of the instrument becomes altered. Besides, as Petit observes, the two assistants rarely act so well in concert together as always to hold the limb in the same direction, and with an equal degree of strength. It is true, such irregularity is not of much consequence at first, while the bone is not half sawn through; but, as soon as the instrument has cut to this depth, the irregular movements of the assistants, who hold the limb, make the sawn surfaces come nearer together, and the saw is so pinched, or locked betwixt them, that it cannot stir in one direction, or the other.

A skilful surgeon (observes Petit) may obviate the difficulty by supporting the part with his left hand, and resisting or yielding at seasonable opportunities to such circumstances as impede the passage of the saw. But, as this judicious writer adds, the difficulty may depend upon the saw itself, when its blade is not duly stretched, the teeth not well turned alternately to the right and left, their points not in good order, their edges not sharp enough, or they are not filed obliquely, so that the bone-dust may be readily thrown off to each side. The latter object requires also, that the blade of the saw at the teeth-part should be rather thicker than the rest of it, or else the fissure in the bone would be completely filled with the instrument, and the bony particles, not easily escaping, would obstruct the movements of the saw. In order to saw the bone as close to the flesh as possible, Petit says the nail of the index finger of the left hand is to be placed on the point where the sawing is to begin. Many surgeons, however, find

* Richter, Anfangsgr. der Wundarzn. b. vii. p. 179.

it more convenient to use the left thumb-nail for this purpose. The flesh being retracted, the saw is now to be applied exactly at the angle formed by the nail and the bone; and the instrument is to be worked very gently, and with scarcely any more pressure than that of its own weight, until a groove is cut, from which it will not start, when the force is to be gradually increased. *

The edge of the saw should cut with both edges, whether the instrument be moved backwards, or forwards, by which means, as a modern writer † has remarked, the operation will be expedited, and the splintering of the bone, when it is nearly divided, prevented, inasmuch as the surgeon, when he uses a saw, which cuts in both directions has it in his power to finish the latter part of the division of the bone entirely with backward sweeps of the instrument, which are always the most regular and gentle.

In order to form a groove for the saw, it is best also to begin by drawing the instrument across the bone with a backward sweep, the teeth near the handle being first applied to the part close to the operator's left thumb, or finger-nail, and the whole extent of the edge is then to be steadily and briskly drawn back to the point. The movements of the saw should never be short and rapid, but every stroke of the instrument should be long, bold, and regular, without too much pressure, however, which is one common cause of the awkwardness so often displayed in this part of the operation. When about two-thirds of the bone are cut through, the pressure and force must be lessened, and towards the very end of the business, two or three gentle movements of the saw backward will complete it without risk of an extensive splintering. In the latter part of the sawing, the assistant who holds the leg must be very careful to avoid depressing the condyles of the femur, as it would inevitably break the bone, previously to its complete division. Indeed, it is difficult to say, whether this mismanagement, or the rough unskilful mode of using the saw itself, is the most frequent cause of the latter accident. The assistant certainly has rather a delicate task to perform, because if he raises the limb too much, he pinches the saw; if he depresses it, he breaks and splinters the bone.

If the bone should happen to break, before the sawing is finished, the sharp projecting spiculæ, thus occasioned, must be removed by means of an instrument, called bone-nippers.

* Petit, *Traité des Maladies Chir.* t. iii. p. 159, 160.

† G. J. Guthrie on Gunshot Wounds of the Extremities, &c. p. 82.

OF STOPPING THE HEMORRHAGE.

After the removal of the limb, the femoral artery is to be taken hold of with a pair of forceps, and tied, without including the accompanying branches of the anterior crural nerve in the ligature. None of the surrounding flesh ought to be tied, though the ligature should undoubtedly be placed round the artery, just where this vessel emerges from its lateral connections. Desault recommends tying the femoral vein, as well as the artery; because when the former of these vessels is left open, and the bandage compresses the upper part of the limb too forcibly, the venous blood returns downward, and hemorrhage takes place, as he is said to have often seen. * Mr. Hey also had seen a few instances of bleeding from the femoral vein, and therefore, he generally inclosed it in the ligature along with the artery. † When the two vessels lie near each other, as is frequently the case, Desault advises the surgeon to introduce one branch of the forceps into the artery, and the other into the vein: the mouths of the two vessels are then to be drawn out, and tied with one ligature. When, however, they are not so close together, they require two separate ligatures. The smaller arteries are usually taken up with a *tenaculum*. After tying as many vessels as require it, one-half of each ligature is to be cut off near the surface of the stump. The right qualities of the ligatures used for securing blood-vessels having been considered in the chapters on hemorrhage and aneurism, it is unnecessary now to return to that interesting topic; nor shall I here again speak of the proposal of removing both ends of the ligature close to the knot; a subject already touched upon in the former volume.

Mr. Alanson judiciously directs, that, when the large bleeding vessels have been tied, the tourniquet should immediately be slackened, and the wound well cleaned, in order to detect any vessel, which might otherwise lie concealed with its orifice blocked up by coagulated blood; and, before the dressings are applied, the whole surface of the wound should be examined with the greatest accuracy. By this means, a pulsation may often be discerned, where no hemorrhage has previously appeared, and a small clot of blood may be removed from the mouth of a considerable artery.

As the lodgment of much coagulated blood would be unfavourable

* *Œuvres Chir. de Desault par Bichat*, tom. ii. p. 550.

† *Hey's Practical Observations in Surgery*, p. 530. ed. 2.

avourable to the speedy union of the wound, the surgeon has also an additional motive for being careful to make its whole surface clean with a sponge and water, before it is finally closed. The number of arteries requiring to be tied, will depend very much upon the incision having been done upon sound and uninflamed parts, or upon parts in a state of inflammation, swelling, and disease. This accounts for the truth of an observation, made by military surgeons, that, in amputations done immediately, or soon after the receipt of an injury, there are much fewer vessels to be taken up, than in what are termed secondary, or long-delayed operations. *

I have occasionally seen examples, in which it has not been necessary to take up a single artery. A young child was run over by a hackney coach, the wheel of which crushed the lower part of the leg, and rendered immediate amputation necessary. The operation was done by the late Mr. Ramsden without delay; no vessel was tied; and the stump healed without any subsequent bleeding. This was one case which I saw, and attended myself. In St. Bartholomew's-hospital, some instances have also fallen under my notice, where arteries like the ulnar and anterior tibial in adults required no ligature. The absence of hemorrhage is sometimes explicable by the clot of blood formed in the large vessels in cases of gangrene. Thus, a modern surgeon tells us, that he amputated the arms of two Cossacks, four months after the limbs had been shot through above the elbow, and while they were affected with hospital gangrene: not a vessel was tied; no secondary hemorrhage arose; and the stump united in the most favourable manner. †

OF DRESSING THE STUMP.

The skin and muscles are now to be placed over the bone, in such a direction, that the wound shall appear only as a line, across the face of the stump, with the angles at each side, from which points, the ligatures are to be left out, as their vicinity to either angle directs. The skin is commonly supported in this position, by long strips of adhesive plaster, applied from below upwards, across the face of the stump. Over these, and the ends of the ligatures, it is best to place some pieces of lint, spread with the unguent. sperm. cet., in order to keep them from sticking, which becomes an exceedingly trou-

* See Guthrie on Gunshot Wounds, &c. p. 90.

† Klein Practische Ansichten der bedeutendsten Chirurgischen Operationen, 1tes Heft. p. 62. 4to. Stuttgart, 1816.

blesome circumstance, when the dressings are to be removed. I am decidedly averse to the general plan of loading the stump with a large mass of plasters, pledgets, compresses, flannels, &c. I see no reason, why the strips of adhesive plaster, and a pledget of simple ointment, should not suffice, when supported by two cross bandages and a common linen roller, applied in a spiral way round the limb, from above downward. The first turn of the roller, indeed, should go round the patient's body; and, being continued down, will fix the two cross bandages over the end of the stump. As is remarked by an eminent writer, here, as after all other operations, the dressings should generally be superficial, and make no compression: if the vessels have been properly secured, there is no risk of hemorrhage; and, if they have not, it is not a little degree of constriction which will hinder bleeding. Besides, much pressure has the serious inconvenience of irritating the parts, exciting inflammation and suppuration, causing an absorption of the cellular membrane, and producing a sugar-loaf stump. *

I conceive, that the elastic woollen cap, commonly placed over all the bandages and dressings, if not put on with a great deal of care, has a tendency to push the skin backward from the extremity of the stump; and, as it must also heat the part very much, I think its employment might very properly be discontinued.

After the operation, the stump should rest upon a pillow of very moderate thickness; for, bending the thigh-bone too much causes a retraction of the flexor muscles.

If possible, the dressings should never be removed before the third day; but, in general, it is quite soon enough to change them on the fourth, or fifth: when the weather is hot, and there is much discharge, they should be taken off earlier, than under other circumstances. The favourable healing of a stump will depend very much upon the skill and tenderness with which the dressings are changed, more especially the first dressings. In order to facilitate the removal of the plasters, they should be first thoroughly wet with warm water, which is not to be rubbed upon them with a sponge, but allowed to drop, or flow over them. Each strip of plaster should be taken off, by raising its ends, and drawing them gently up together towards the extremity of the stump, by which means, the surgeon will avoid pulling the recently united parts away from each other. During the change of the dressings, an assistant is always to

* *Œuvres Chir. de Desault, t. ii. p. 552.*

support the flesh and keep it from retracting, and for the more complete prevention of the same disadvantage, it is a good rule in many cases never to have every strip of plaster off the limb at one time; but, as soon as some are removed, to put on others, before the rest are loosened and taken away. It is hardly necessary to add, that, when matter is collected within the stump, it should be very gently compressed out with the sponge, in doing which the pressure should invariably be so regulated, as not to have any tendency to force back the flesh.

At the end of five or six days, the surgeon may begin to try, in a very gentle manner, whether any of the ligatures are loose. However, he should not use the smallest force, nor persist, if the trial should create pain. One would hardly try, whether the ligature on the great artery were loose before the eighth or ninth day.

FLAP-AMPUTATION OF THE THIGH.

Although this operation is not approved of by the best modern French and English surgeons, as a method fit to be practised in ordinary cases, they all acknowledge its advantages under particular circumstances. In Germany, however, as far as I can judge from the latest and most celebrated works published there on the subject of amputation, flap-amputations have more numerous advocates, and, I believe, that whoever will take the trouble of inquiring into the actual state of surgery in that country, will find the method of operating, here alluded to, generally preferred to the practice of the circular incision.* However, one great and experienced French operator, Desault, employed both modes on the thigh, or arm, indifferently; though he did not apply the flap-amputation to the leg, or fore-arm.† In England, however, where the latter method first originated with Lowdham, and where it has at various periods been strongly commended and improved by several

* Consult particularly C. C. Siebold, *Diss. de Amputatione femoris cum relictis duobus carnis segmentis*, Wirceb. 1782.; Gräfe, *Normen für die Ablösung grösserer Gliedmassen*, Berlin, 1812.; Richter, *Anfangsgr. der Wundarzneykunst*, b. vii., Kap. 7. 8vo. Göttingen, 1804.; Klein, *Practische Ansichten der bedeutendsten Chirurgischen Operationen*, 1tes Heft, 4to. Stuttgart, 1816.; H. J. Brunninghausen, *Erfahrungen und Bemerkungen über die Amputation*, 12mo. Bamberg, 1818. This last surgeon recommends making the flaps from the integuments, and not from the muscles, which, he asserts, shrink and diminish after the operation, so as not to form a durable cushion for the end of the bone.

† *Œuvres Chirurgicales de Desault*, tom. ii. p. 547.

men of great eminence, it is never at present considered as the best for general adoption. The chief objections to the operation, when proposed as the common method, arise from two considerations: first, its greater pain *, than that of the usual mode; secondly, its shortening the limb more than is necessary. Yet, all British surgeons agree, that flap-amputations are generally the best, when a limb is to be taken off at a joint, and also in every instance, in which the skin and soft parts are quite sound on one side of a member, while, on the other, they are diseased, or destroyed for a considerable extent upwards. Here, amputating with a flap will be the means of preserving more of the limb, than could be saved by the circular incision, and becomes praiseworthy on the very same principle, which renders the latter method most eligible under ordinary circumstances.

As Mr. Hey has remarked, sometimes the integuments of the thigh are in a morbid state on one side of the limb, while they are sound on the other. In this case, a longer portion of integuments and muscular flesh must be left on the sound side; which will not prevent the formation of a good stump. The morbid state of the anterior or posterior side of the thigh sometimes extends so far above the knee, that it is advisable to amputate with a flap. †

At the upper part of the thigh, Mr. Guthrie ‡ appears to prefer amputating with a flap, as a general practice; but unless there were some particular circumstances present, some motives like those already suggested, I should not be disposed to select, what is allowed to be, by far the most tedious and painful method of amputating. Were the thigh-bone, however, injured high up, and had gangrene extended about the trochanter major and posterior upper part of the thigh, if the head of the femur were sound, and the patient able to bear an operation, I would then do as Klein did — make a flap at the inner and upper part of the member. § The execution of a flap-amputation of the thigh

* Klein, who has decided in future always to amputate the thigh with a flap, in consequence of this method forming a better stump, and the wound healing in less time, than after the circular incision, owns that the operation is attended with considerable more pain. See *Practische Ansichten der bedeutendsten Chirurgischen Operationen*, 1tes Heft, p. 34, 35.

† Hey's *Practical Observations in Surgery*, p. 531. ed. 2.

‡ On Gunshot Wounds of the Extremities, p. 200.

§ *Practische Ansichten der bedeutendsten Operat.* p. 39. 1tes Heft. The soldier, thus treated, got well in three weeks. See also another case, p. 42., in which it was necessary to make a flap at the inside of the limb,

will be attended with some difference, according as the soft parts on all sides of the limb are sound, or not. When, in consequence of the flesh being injured or diseased on one side, the flap must be entirely formed on the other, it will be necessary to save more skin and muscle in the latter situation, than would be requisite, if the surgeon were to have it in his power to form two flaps for covering the end of the bone. In performing the latter operation on the thigh, Desault used to grasp the flesh on its inner side with his left hand, and pass a straight, narrow, sharp-pointed knife, with its edge turned towards the knee, through the soft parts thus taken hold of, pushing it on from the fore-part of the thigh, until the point came out at the back of the limb. The incision was then extended obliquely downwards, so as to make a flap about four inches in length, comprehending part of the cruralis, the vastus internus, the femoral artery and vein, the anterior crural nerve, the triceps, sartorius, gracilis, semi-membranosus, and semi-tendinosus muscles. This first flap was then reflected, and the femoral artery and vein, and the trunk of the profunda tied. The external flap was next formed in a similar way, and consisted of the rest of the cruralis, the rectus, the vastus externus, and biceps. The two flaps were then held back, the bone sawn through as high as possible, the other bleeding vessels secured, and lastly the flap brought down so as to meet in a perpendicular line, and cover the end of the bone. *

AMPUTATION BELOW THE KNEE.

In the thigh, we amputate as low as the nature of the case will allow us. In the leg, the common practice is to make the incision through the integuments sufficiently low, to enable the operator to saw the bones, about four inches below the lower part of the patella. This is necessary, in order to have a sufficient surface in front of the limb for the application of a wooden leg, and not to deprive the stump of that power of motion, which arises from the flexor tendons of the leg continuing undivided.

in consequence of a sinus extending far up towards the buttock, and rendering a circular incision unadvisable. This operation succeeded, though done only one inch below the great trochanter.

* See *Œuvres Chir. de Desault*, p. 559. As taking up the vessels before the bone is sawn keeps the patient in an anxiety, which never ceases before the limb is off, I should prefer imitating Klein, and saw the bone, before searching for the artery, as in a common amputation. See Klein's *Practische Ansichten der bedeutendsten Chir. Operat. 1tes Heft*, p. 37.

The tourniquet should be applied to the femoral artery, two-thirds of the way down the thigh, just before the vessel perforates the tendon of the triceps muscle. This is a much more convenient situation, than the ham. The leg being properly held, the integuments should next be drawn upward by an assistant, while the surgeon, with one quick stroke of the knife, must divide the skin completely round the limb. Some recommend the operator to stand on the inside of the leg, in order to be able to saw the bones at once. No reflections could ever make me perceive, that any real advantage ought strictly to be imputed to this plan. I know, that many think it diminishes the chance of the fibula being splintered, as this bone is completely divided rather before the tibia. But, as splintering the bones arises from the assistant, who holds the leg, depressing the limb too much, it would be difficult to explain, why the two bones should not be splintered, when a certain thickness of them has been sawn through, if the leg were too forcibly depressed.

Having made a circular division of the integuments, the next object is, to preserve skin enough to cover the front of the tibia and the part of the stump corresponding to the situation of the tibialis anticus, extensor longus pollicis, and other muscles, between the tibia and fibula, including those covering the latter bone. Throughout this extent, there are no bulky muscles, which can be made very serviceable in covering the end of the stump, and the operator must consequently save sufficient skin in this situation, by dissecting it from the parts beneath, and turning it backward.

On the posterior part of the leg, on the contrary, the skin should never be detached from the large gastrocnemius muscle, which, when obliquely divided, will, with the soleus, here form a sufficient mass for covering the stump. Hence, as soon as the skin has been separated in front, and on the outside of the leg, the surgeon is to place the edge of the knife in the incision of the integuments, and cut in the Alansonian way through the muscles of the calf, from the inside of the tibia, quite to the fibula. Then the flap, formed by the calf of the leg, is to be held back by the assistant, while the surgeon completes the division of the rest of the muscles, together with the interosseous ligament, by means of the catling, a kind of long, narrow, double-edged knife.

In amputating below the knee, very particular care must be taken to cut every fasciculus of muscular fibres, before the saw is used. Every part being divided, except the bones, the soft parts are next to be protected from the saw, by a linen

retractor, made with three tails, one of which is to be drawn through the space, between the tibia and fibula.

In the leg, there are only three principal arteries, requiring a ligature, viz. the anterior and posterior tibial, and the peroneal arteries.

When the wound is to be dressed, the soft parts preserved for covering the bones should be brought together, so as to make the line of their union not transverse, but obliquely perpendicular, the lower end of it being more external than the upper. Thus the tibia and fibula may be most effectually covered, and there will not be any occasion for letting the strips of adhesive plaster forcibly press the skin against the sharp edge of the tibia; a method which should always be avoided. The plaster which makes most pressure should go over the centre of the stump, at the point corresponding to the interosseous space. *

AMPUTATION OF THE ARM.

As M. Sabatier remarks, the structure of the arm bears a great analogy to that of the thigh. There is only one bone, round which the muscles are arranged, the deep ones being adherent to the os brachii, while the outer ones extend along the limb, without being attached to this bone. The first are the brachialis internus, and the two short heads of the triceps; the others are, the long portion of the latter muscle, and the biceps. Hence amputation, in this situation, is performed, in a very similar manner to the same operation on the thigh, unless it be necessary to remove the limb above the insertion of the deltoid muscle. †

The patient may either sit on a chair, or lie near the edge of a bed, and an assistant is to hold the arm in a horizontal position, if the state of the limb will allow it. The pad of the tourniquet is to be applied to the brachial artery, as high as convenient. The assistant is then to draw up the integuments, while the surgeon makes the first circular incision. In this operation, the skin need only be detached from the muscles to a very trivial extent, as there is no fear of not having sufficient flesh and integuments to cover the bone. When the muscles, in front of the arm, are to be divided, the elbow should, if possible, be bent by the assistant, who holds the arm, and, if the joint

* There are cases, in which it may be advisable to amputate below the calf, or even near the ankle. Low down, the operation is frequently performed with a flap: but this is a subject, which I cannot at present take up.

† Médecine Opératoire, tom. iii. p. 242.

were quite moveable, the limb might be placed in a straight posture, when the division of the triceps is to be effected. It is best to divide the biceps first, and after the retraction of this loose muscle, to cut the brachialis internus, which is fixed to the bone, by an incision sloping obliquely upward.

However, the triceps may be cut through at once, by one sweep of the knife, with its edge inclined obliquely upward. The rest of the proceedings do not require description after the account already given of what is necessary in amputating the thigh.

When it becomes indispensable to amputate the arm very high up, there is no room for the application of the tourniquet. In this instance, the subclavian artery is to be firmly compressed, as it passes over the first rib, by an assistant, who can most effectually accomplish this important object, by pressing from above the clavicle a pad on the vessel with the handle of a key, or any other suitable instrument. The danger of a sudden profuse hemorrhage having been thus guarded against, the operation is to be done variously according to circumstances. When the bone can be sawn through below the insertion of the pectoralis major, there is no peculiarity in the method of operating. But, if it be indispensably necessary to take off the limb still higher up, the circular incision is not adopted. Here some surgeons make a flap of part of the deltoid muscle, and commence with making an incision corresponding to its margin in shape and situation. Then the muscle is to be detached from the bone beneath, so as to form the flap, which is to be turned up. The operation is now finished by cutting through the other soft parts, from one side of the base of the flap to the other.

Instead of making a short stump, when the arm must be taken off very high up, M. Larrey thinks it a more advisable practice to amputate at the shoulder-joint. He says, that, if the humerus is sawn through higher than the insertion of the deltoid muscle, the stump becomes retracted towards the armpit by the pectoralis major and latissimus dorsi; the ligatures on the vessels irritate the brachial plexus of nerves; great pain and nervous twitchings are apt to be excited; tetanus is frequently brought on; the stump is affected with considerable swelling; and, at length, an anchylosis of the shoulder follows.*

According to the experience of Mr. Guthrie, when amputation is attempted at the insertion of the pectoralis major, the bone will mostly protrude after a few dressings;

* See Larrey's *Memoires de Chirurgie Militaire*, tom. iii. p. 53. &c.
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and, frequently, a disagreeable and painful stump be the consequence. The artery is also liable to retract into the axilla, where it cannot readily be taken up. In cases of this description, instead of amputation at the shoulder-joint, Mr. Guthrie advises the following operation: "Two incisions of a similar shape are to be commenced, one or two fingers breadth below the acromion, as the case may require; the point of the inner one, instead of ceasing, as in the operation of the shoulder, a little below the pectoral muscle, is to be carried directly across the under part to meet the point of the outer incision; so that the under part of the arm is cut by a circular incision, the upper in the same manner as in the operation at the shoulder. These incisions are only through the skin and cellular membrane, which have liberty to retract, but are not to be turned up. The deltoid and pectoralis major are then divided close to the inner incision, and the opposite portion of the deltoid, with the long head of the biceps on the outside, to the extent of the outer incision. A half-circular cut on the under part, in the line of the skin down to the bone, clears it underneath, and shows the artery retracting with its open mouth, which is at this moment advantageously pulled out by a tenaculum, and secured." The flaps are then held asunder, and the bones sawn &c.*

I should conceive that either this method of operating, or that previously mentioned, which appears to me more simple, ought to be preferred to taking the humerus out of the glenoid cavity, when the nature of the disease or injury does not actually render amputation at the joint indispensable.

AMPUTATION OF THE FOREARM.

The forearm is to be amputated as low as the case will allow. The tourniquet is to be applied a little above the condyles of the humerus, with its pad on the brachial artery, at the inner edge of the biceps muscle. While one assistant holds the hand, another is to take hold of the forearm, above the place where the first circular wound is to be made. Thus, in conjunction with the former, the latter will be able to fix the limb in a proper manner, and at the same time draw up the integuments. After the amputating knife has been carried round the limb, the skin is to be detached from the fascia, a little way upward. The muscles are then to be divided

* Guthrie on Gunshot Wounds, p. 340.

obliquely upwards with the common knife, as long as this will do what is to be done with convenience, and the catling is afterwards to be employed for completing the division of the soft parts, situated between the radius and ulna. The retractor is to be applied, and the bones sawn, with the hand in the state of pronation.

In general, only four vessels will require ligatures, viz. the radial, ulnar, and two interosseous arteries.

Baron Larrey thinks it always advantageous to take off the forearm in its fleshy part, notwithstanding the nature of the disease, or injury, would admit of the operation being done towards the wrist. As, however, I have amputated several forearms close above the wrist, and the stumps healed in the best way, I see every reason for still adhering to the old good maxim of saving as much of the limb as possible. The cause of the bad success, which many of the French surgeons have had after amputating in the tendinous part of the forearm, has been correctly referred by Mr. Guthrie to their prejudices against the method of attempting to heal the stump by the first intention.*

In the lower part of the forearm, Mr. Guthrie † prefers making two flaps; a method, which another surgeon ‡ particularly recommends in amputating the more fleshy part of the member below the elbow: as far as my own observations extend, however, I see no reason for deviating in either situation from the ordinary method.

AMPUTATION AT THE SHOULDER JOINT.

The loss of blood is to be prevented, by compressing the subclavian artery, in the way mentioned in the account of high amputations of the arm. With a large common bistoury, a semicircular incision is to be made, with its convexity downward, across the integuments covering the deltoid muscle, about four inches below the acromion. § The skin is not to be detached; but, the surgeon is to proceed immediately to raise the muscle from the bone, quite up to the joint. If the

* On Gunshot Wounds of the Extremities, p. 370.

† *Ib.* p. 372.

‡ Klein's *Practische Ansichten der bedeutendsten Chirurgische Operationen*, p. 45. 1st. Hef. 4to. Stuttgart, 1816.

§ The horns of the semicircle, if I may use the expression, are to extend upward along the anterior and posterior margin of the deltoid muscle.

circumflex arteries bleed considerably, they are now to be tied, before the operator proceeds further. Then the surgeon should cut the tendons passing over the joint, and, also, the capsular ligament, so as to be enabled to dislocate the head of the bone from the glenoid cavity of the scapula. Having proceeded thus far, he is to take an amputating knife, and, with one stroke, divide the skin, muscles, and other parts underneath the joint, so as to complete the operation. The mouth of the axillary artery should be instantly taken hold of with the fingers, or forceps, and tied.

The flap of the deltoid muscle is next to be laid down, and its edge will then meet the margin of the wound below.

The preceding method of operating was first practised by the celebrated De la Faye, and is one of remarkable simplicity, as I can truly affirm, not only because I have tried it myself, but seen it done on several occasions by other surgeons. The last case at which I was requested to give my assistance, was a patient of Dr. Blicke's, the operation being done as a last resource for a spreading mortification of the arm from external violence; and, though the man survived only about a fortnight, nothing could be more easy than the operation itself, and it was impossible to have had a better stump.

In order to make a flap of the deltoid muscle, some operators prefer first pushing a catling, or long straight double-edged knife, through the muscle near the joint, and, next cutting downwards, they detach as much of the flesh from the bone, as they consider necessary: the flap is then turned up; the tendon of the long head of the biceps divided; and the operation finished, as already described. It was in this manner that Loder chose to perform the operation. *

Nothing, however, exhibits more strikingly the absurdity of generalizing too much even upon the subject of amputation, than the fact, that excellent as the preceding flap operation is for the shoulder, the exclusive preference to this method, as declared by some writers, has been made without reflecting, that, in many of the examples in which amputation at the shoulder is indicated, the middle and upper portion of the deltoid muscle is very much lacerated, or more or less of it actually torn away. Under such circumstances, a sufficiency of soft parts for making the flaps must be saved at the anterior and posterior sides of the shoulder; a plan which, modified and executed in various ways, is approved of by a consider-

* Chirurgisch-Medicinische Beobachtungen, b. i. p. 11. 8vo. Weimar, 1794.

able number of very judicious and experienced surgeons, even where circumstances leave a choice of this, or the foregoing method. In particular instances, on the other hand, the case leaves the operator no possibility of making the flap on each side of the articulation. Favourably as I have spoken of the mode of making a single flap of the deltoid, I do not consider it a matter of great importance, whether that operation, or the other above spoken of, be selected, where circumstances offer a choice; for, both methods have now been rendered extremely simple and perfect. As I have described in the Dictionary all the principal methods of amputating at the shoulder-joint, I shall here avoid a repetition of the subject.

Sinuses, very difficult to heal, and discharging a thin fluid, are not unfrequent after this operation. They were ascribed by Alanson to the slowness with which the cartilage of the glenoid cavity exfoliates. In some instances, in which the excision of this cartilage was performed, the patients soon recovered; while, in certain other cases, in which this measure was neglected, incurable fistulæ afflicted the patients for many months after the amputation. * Probably, however, the delay of the cure might be owing to other causes; and neither Larrey, nor Mr. Guthrie †, consider it necessary to scrape the cartilage off the glenoid cavity.

As I have explained in the chapter on gun-shot wounds, the necessity for amputation at the shoulder joint may often be removed, and the limb be preserved, by the performance of a more simple and less mutilating operation. This consists in merely making an incision for the extraction of the diseased, or splintered head of the humerus, and, if necessary, of the adjoining part of the scapula. The arm is afterwards to be properly supported in a sling, so as to keep the upper end of the humerus as far upward as possible. It was in an example, where the head of the humerus was diseased, that this judicious practice was first adopted by Mr. Charles White ‡, of Manchester; and Larrey, in the course of the Egyptian campaign, superseded in not less than ten instances, the necessity of amputating at the shoulder, by the complete and immediate extraction of the head of the humerus, and the splinters. §

* See London Medical Review, vol. iv. p. 94. Also, Klein's *Practische Ansichten der bedeustendsten Operationen*, 1tes. Heft. p. 26.

† On Gunshot Wounds, p. 284; &c.

‡ See his *Cases in Surgery*.

§ *Relation Chirurgicale de l'Expedition de l'Armée d'Orient en Egypte* &c. p. 315.

AMPUTATION OF THE FINGERS AND TOES.

The removal of a toe, or finger, though easy of accomplishment to a skilful surgeon, may make another one, who is not aware of the proper method of operating, appear exceedingly awkward. A small semilunar incision is to be made on the back of the finger or toe to be amputated. This wound must extend across the part, and its greatest convexity be about half an inch in front of the joint, into which the surgeon intends to cut. The little flap is next to be raised, and reflected. Next, the skin, in front of the finger, and immediately over the joint, is to be divided, so that this second cut must extend across the finger, or toe, and meet the two ends of the first semilunar incision. The joint is now to be bent, and the capsular ligament opened. If the surgeon were to attempt to cut into the joint, with the finger, or toe, in a straight position, he might try a considerable time before he would succeed. Things being accomplished so far, the next object is to divide one of the lateral ligaments, which, after an opening is made into the capsular ligament, may be most easily effected. This allows the head of the bone to be dislocated, and the surgeon has nothing more to do, than to cut such other parts, as still attach the part, about to be removed, to the rest of the limb. When the arteries bleed much, they must be tied; but, it frequently happens, that the hemorrhage will stop without a ligature, as soon as the flap is applied to the end of the stump, and the adhesive plaster has brought the edges of the wound accurately together.

Some surgeons consider it quite unnecessary to make any semicircular flap of the skin; and prefer drawing the integuments a little up, and then dividing them in a circular manner. By this mode, no doubt, when the integuments are not thickened and adherent, quite enough skin may be preserved for covering the end of the bone.

When it is necessary to remove the metatarsal bone of the great, or little, toe, it is better to saw off the diseased portion, than to cut into the joints of the tarsus. Sufficient skin should be saved for covering the wound, and, when the saw is used, the adjoining soft parts must be defended from injury by a piece of pasteboard, placed between them and the teeth of the instrument. *

* The methods of amputating a part of the foot having been fully described in the Dictionary, are here purposely omitted.

When the thumb is to be amputated, a flap is also to be preserved for covering the end of the stump.

CHAPTER XXXVIII.

PARONYCHIA, OR WHITLOW.

A WHITLOW is a very painful, inflammatory swelling about the extremity of the finger, or at the root, or sides of the nail, and it is remarkably prone to suppurate. Authors describe different sorts of whitlows. Only four seem to merit distinction, and these chiefly differ from one another, merely in regard to the depth of the situation which they occupy.

The first is situated under the cuticle, and begins at the corner of the nail, in the form of a little tumour, which spreads all round. When matter is collected, it may be discharged, by cutting the cuticle with a pair of scissors; a thing, which may be accomplished without the slightest pain. Sometimes, the natural connections of the root of the nail are destroyed, and this part separates to make way for a new nail, which nature produces.

In the second species, an unpleasant sensation of heat is experienced at the extremity of the finger, for some days; the part becomes gradually more tender and painful; it swells, but the skin is not discoloured; and, if the inflammation should not end in resolution, a thin matter collects between the skin and subjacent parts. On this fluid being evacuated by an incision, immediate relief is generally obtained.

The third kind of whitlow is situated in the theca of the flexor tendons of the fingers. When the inflammation continues beyond a certain period, the fluctuation of matter is sometimes plain enough about the joints, and even in the hand; but it is not generally distinguishable over the phalanges, on account of the dense, firm structure of the tendinous sheath.

The fourth kind of whitlow extends to the periosteum and bone. The complaint is attended with an acute, deep-seated pain, and a swelling, which is more confined to the phalanx affected, than the tumefaction accompanying other whitlows. On an incision being made to discharge the fluid, this is found lodged beneath the periosteum, while the bone is rough and in a state of necrosis.

When whitlows are very severe, the throbbing of the arteries extends a considerable distance up the arm, and the febrile symptoms run high.

Whitlows often originate from external causes, such as bruises, pricks, the lodgment of a thorn, or bit of broken glass, &c.; but, in general, we find, that the complaint occurs, without being preceded by any assignable cause whatever.

TREATMENT.

Topical applications of two very opposite classes have been recommended, viz. fomentations, poultices, and all sorts of emollient remedies; and vinegar, spirits, and astringent applications in general.

Excepting the first case of whitlow, the formation of matter seems to be productive of no relief, and experience evinces, that there is no advantage in promoting the event. It is even certain, that the pain is increased by the accumulation of fluid. When matter is already collected, no effectual benefit is ever derived from emollients, especially when the whitlow is deep; for, then the fluid never partakes of the nature of the pus. Hence, the best practice is to try to prevent a collection of fluid from taking place by applying leeches and topical astringents to the part, and using antiphlogistic means. In very violent cases, in which the swelling extends as far as the arm, and the fever is considerable, venesection should be practised, and opium exhibited.

Brandy, spirit of wine, ice, and vinegar, are as good topical applications as any which can be mentioned.

Let it be remembered, however, that such treatment is only proper for preventing matter from accumulating, and that, when fluid is already collected, the indication is to make an immediate opening for its discharge. The incision should always be sufficiently large to allow the matter to escape in a ready manner. The surgeon should not wait for whitlows to point: for were he imprudently to delay making an opening, until the pointing happened, the matter would spread very extensively within the tendinous thecæ, and soon induce a carious affection of the bones. On an opening being made into the collection of fluid, a director should be introduced, and the wound enlarged by cutting upon this instrument. A simple pledget is often a better dressing, than poultices.

When there is only a single phalanx affected with necrosis, some practitioners deem it more advisable to enlarge the wound sufficiently to allow the part to be dissected out, than to wait for the completion of tedious exfoliations. Generally

speaking, I believe it is best not to be in a hurry about the excision of the bone, which, unless it be perfectly loose, cannot be taken out without as much pain, as that usually caused by a removal of the whole finger.

CHAPTER XXXIX.

VENESECTION.

IN whatever part of the body venesection is to be practised, it is necessary to make pressure on the vein, betwixt the place where the puncture is to be made, and the heart. Thus the return of blood through the vessel is prevented, consequently it swells, becomes conspicuous, and bleeds freely, which it would not do, if the blood could readily pass on towards the heart.

In bleeding in the arm, a fillet, or bandage, is to be tied, with moderate tightness, round the arm, a little above the elbow. The design of doing this is, to intercept the passage of the blood through all the superficial veins, without obstructing the circulation through the artery, as in this circumstance, the veins evidently could not be rendered turgid.

The surgeon, before putting a ligature round the arm, should always feel where the pulsation of the artery is situated, and, if equally convenient, he should not open the vein immediately over this part. It is also proper to examine where a pulsation is situated, on account of the occasional varieties in the distribution of the arteries of the arm. The ulnar artery is sometimes given off from the brachial high up, and, in this case, it frequently proceeds superficially over the muscles, arising from the internal condyle, instead of diving under them, in the ordinary manner.

In general, it is best to select a vein which rolls least under the skin. Such a vessel, though sometimes not so superficial as another, may commonly be more easily opened. However, the operator is always to fix the vein, as much as he can, by placing the thumb of his left hand a little below the place where he intends to introduce the lancet.

More depends on the mode of using this instrument, than on its shape. It should be pushed into the vein in an oblique direction, and, when its point is a little within the cavity of the vessel, it is not to be introduced further, but the opening

is to be rendered sufficiently large by carrying the front edge of the lancet obliquely forward and upward, by which movement, it is also brought out of the part again. In cases of herniæ, dislocations, &c. it is often a great desideratum to make a free opening, in order that the sudden evacuation of blood may make the patient faint. The puncture being made, the patient is to support his arm, in a convenient position for allowing the blood to flow into a basin, by taking hold of a stick, which he may turn round and round in his hand, in order to put the muscles into action, and make the blood flow out in a freer current. Sometimes, however, it escapes so readily, that there is no occasion to exert the muscles of the arm. When the patient is so circumstanced, that he cannot take hold of a stick, the surgeon is to support the arm in a convenient posture; and, if the vein should not bleed in a free manner, he is to desire the patient to take hold of any small body, and move it about in his hand, in order to put the muscles of the forearm into action.

The due quantity of blood having been taken away, the ligature is to be loosened, and removed. The current of blood now generally ceases, and always does so, when the surgeon places the thumb of his left hand just below the orifice. The arm in this state is to be washed with a sponge, and dried. The edges of the wound are to be placed in contact, and kept so by a small compress of lint, which is to be bound on the part, by applying the bleeding fillet round the arm, in the form of a figure of eight. The bandage is to meet and cross in front, exactly over the dossil of lint.

When the external jugular vein is opened, the surgeon generally makes the necessary pressure with his thumb. The orifice should be made in the direction of the fibres of the platysma myoides muscle, and the vein is not so apt to glide out of the way, when the surgeon opens the vessel, just where it lies over some part of the sterno-cleido-mastoideus.

The temporal artery, and its branches, are the only vessels, in which surgeons now ever perform arteriotomy. When the branch is superficial, it may be punctured at once; but, in other cases, it is best first to make a small incision through the integuments. After the due quantity of blood has been taken away, the bleeding may usually be stopped, by means of a roller and compress. When the hemorrhage after the operation proves troublesome, some surgeons recommend cutting the vessel completely across, in order to allow it to become retracted.

CHAPTER XL.

PARTICULAR FRACTURES.

FRACTURE OF THE OSSA NASI.

THE lower portion of these bones being most exposed to violence, is most liable to be broken. The two bones are not always fractured together: sometimes one is broken all across, while the other, without having suffered any solution of continuity, is either elevated or depressed. Falls, or blows on the face, are the usual causes of the accident, and hence, the soft parts are generally at the same time either very much contused, or wounded. These cases are often attended with a fracture of the perpendicular lamella of the os ethmoides, which process is thrown more or less to one side, or the other. The accident is commonly followed by inflammation of the pituitary membrane; swelling of the nose and adjoining parts of the face; ophthalmia; and a great deal of hemorrhage from the nostrils, through which the breathing is more or less obstructed. The blow, which breaks the ossa nasi, may also produce a concussion of the brain; an extravasation of blood within the cranium; or, if we can believe some accounts, pressure on the brain, from the crista galli being actually driven inward.

On this subject, however, a modern surgeon has remarked, that the apprehension, about the vomer and perpendicular lamella of the os ethmoides transmitting to the base of the skull and to the brain the effects of the violence applied to the broken ossa nasi, is quite destitute of foundation, inasmuch as those bony plates are very thin, and always displaced to one side, or the other; and, if some symptoms of injury of the brain are observed after these fractures, it is more natural to ascribe them to the intimate connection betwixt the bones of the nose and that of the forehead. *

Unless the swelling of the soft parts be very considerable, the diagnosis of a fracture of the ossa nasi is too obvious to need any detail.

The displaced portions of bone are to be raised, or depressed, to their proper level, by introducing a probe, rolled

* Delpech, Précis Élémentaire des Maladies réputées Chirurgicales, tom. i. p. 221. 8vo. Paris, 1816.

round with lint, to the upper part of the nostril, and moving the pieces of bone into their proper position, by means of the conjoint operation of the probe on the inside, and of the fingers on the outside, of the fracture. If the perpendicular process of the os ethmoides should be beaten to one side, it is to be replaced with a probe, as well as circumstances will allow. If there should be reason to conjecture, that the crista galli were driven inward, and pressing upon the brain, the surgeon might endeavour gently to draw downwards the vomer and perpendicular lamella of the ethmoid bone, by means of an instrument, like a director, passed up into each nostril. I believe, with Delpech, however, that such a case is very uncommon, and that when the brain is injured, it is not from any displacement of the crista galli, but from the concussion or blow itself affecting the brain.

The ossa nasi, when duly replaced, are not liable to be drawn out of their proper situation by the action of any muscles. When the broken pieces have a propensity to fall inwards, some authors talk of supporting them by dossils of lint, smeared with any softening ointment, and introduced up the nostrils, or of employing tubes with a similar intention: but, I believe, that few good practical surgeons would think such contrivances at all likely to be of any real service. The truth is, I believe, that no apparatus can have any effect in keeping the broken pieces of bone in the right position. As Delpech has observed, all outward compression must have a tendency to displace them; and, as for the tubes which have been occasionally passed into the nostrils, they cannot reach the fragments, and of course cannot afford them any support. Nor are they at all needed, for the purpose of facilitating respiration, which can always be performed very well through the mouth. Lastly, these instruments produce all the inconvenience of a foreign body in contact with parts already inflamed, or about to become so. The indications, therefore, must be limited to some discutient, or emollient application, according as the state of the soft parts may require, and general antiphlogistic remedies.

FRACTURES OF THE LOWER JAW-BONE.

This bone may be fractured either in its body, or rami, on one side or both; at the neck of one of the condyles, or near the symphysis. According to Delpech, the fracture is never situated exactly at the symphysis itself; but this remark is incorrect, at least with respect to children, in whom the

bone sometimes splits in that very situation.* The injury may be either a single solution of continuity, or a comminuted fracture, that is to say, a case, in which the bone is broken into several pieces.

Fractures of the jaw admit very well of a general division into those which occur between the symphysis of the bone and the insertion of the masseter, and which may be called fractures of the chin; those, which happen at some point between the same insertion and the coronoid process, and which may be termed fractures of the angle; and others affecting the neck of the condyle.

As Delpech has also remarked, the lower jaw-bone, being strong and moveable, cannot be broken without a good deal of violence, traces of which are almost always left in the soft parts.

When the fracture has happened towards the chin, whether the bone be broken on one side, or both, the fragment comprehending the symphysis is drawn downwards. If the fracture be oblique, this sort of displacement is much more considerable, especially when the solution of continuity runs downwards and backwards, as it frequently does; for, in this case, the direction of the muscles, which depress the jaw, and are chiefly inserted into the portion of bone most liable to be drawn out of its right place, is parallel to that of the fracture, and consequently they have a greater effect in producing the displacement.

On the other hand, both sides of the lower jaw between the insertion of the masseter and the angle of the bone, as well as the coronoid process itself, are covered by muscular attachments. Hence such fractures as happen in all this extent of the bone, are liable to but little displacement. In fact, the pterygoid, temporal, and masseter muscles here oppose the tendency of the digastric and other muscles to pull the part of the bone anterior to the fracture downwards; and the process of reunion is only exposed to the disturbance which may be the consequence of the movements of the whole bone.

When the neck of the condyle is fractured, the condyle itself is apt to be displaced forwards by the action of the external pterygoid muscle, which is attached to the forepart of the neck.†

A fracture of the lower jaw may be detected by introducing

* See *Operative Surgery* by C. Bell, vol. ii. p. 219. 8vo. London. 1809.

† Delpech, *Précis des Mal. Chir.* t. i. p. 223—225.

a finger into the mouth, and pressing on the front teeth of the side on which the fracture is supposed to be, while, at the same time, the fingers of the other hand are applied to the basis of the bone, near the angle. On making alternate pressure in each of the above situations, the bone may be felt to move, and a crepitus distinguished. This painful mode of examination, however, is not invariably requisite; for, when the fracture is displaced, the nature of the accident is obvious enough without any such proceeding. In this case, the body of the bone is drawn downwards from the rami; the mouth is more or less open, and so distorted that the commissure of the lips is much lower on the injured side than the other; while the front teeth are below the level of the molares; the regularity of the arch formed by the teeth and alveolar process being more or less destroyed.

The generality of fractures of the jaw are easily reduced; but the reduction cannot be maintained without difficulty.

When the fracture is not displaced, the surgeon need only adapt some pasteboard, wet and softened with vinegar, to the outside of the jaw, both along its side, and under its basis. Over this wet pasteboard, a bandage with four tails is to be applied, the centre being placed on the patient's chin, the two posterior tails pinned to the front part of his night-cap, and the two anterior attached to a part of the same cap, more backward. When the pasteboard becomes dry, it forms a convenient apparatus for supporting the fracture. The soap plaster frequently applied to the skin is rather to be considered as a thing done for the amusement of the patient and bystanders, than as a measure of any real utility.

When the symphysis appears to be drawn below the level of the base of the jaw behind the fracture, the coronoid process is to be gradually pushed backward with the index finger of one hand, while the index and middle fingers of the other hand are to be applied to the front teeth, and the thumb to the basis of the anterior part of the jaw. At the same moment that the coronoid process is pushed backwards, the front portion of the bone is to be raised and inclined forwards. When one end of the fracture is situated over the other, the two parts of the bone are to be pushed in opposite directions, and if this be skilfully done, the slightest pressure on the extremities of the fracture will suffice for placing them in contact.

That the fracture is well reduced, may always be readily known by adverting to the evenness of the dental line, and that of the base of the jaw.

When any teeth are driven out of their sockets, they should

be immediately introduced again, and, if necessary, tied to the adjoining teeth, by means of a piece of catgut, or gold wire. However, when the displaced tooth belongs to the very situation at which the fracture has occurred, it is generally thought most advisable to remove it altogether.

The surfaces of the fracture having been placed in even contact, the jaw is to be covered with pasteboard, and the four-tailed bandage applied. It will also be necessary to counteract the action of muscles, between the lower jaw and os hyoides, by supporting the front portion of the bone with compresses placed under the bandage.

According to Delpsch, nothing is more essential for keeping the fragments in their right place, than applying betwixt the teeth of the upper and lower jaws a piece of cork, cut into a suitable shape, and with depressions for receiving the projections formed by the teeth. Without this apparatus, he says, the four-tailed bandage, the pasteboard, and even the plan of fastening the adjoining teeth together with wire, or catgut, will not have due effect. A similar piece of cork is also to be placed between the teeth on the opposite side, an interspace being left between the two portions sufficient to receive a small spoon, with which the patient is to be fed. *

In the treatment of these cases, I have not myself found it generally necessary to interpose any substance between the teeth.

I should not object, however, to following this method, if it were at all likely to be of any assistance; and several practitioners recommend it for various, and (as they suppose) good reasons. Thus a modern writer observes, "if the teeth be very regular, and those of the upper and lower jaw correspond, those of the upper jaw serve the purpose of secure splints, when the base of the jaw and chin are bandaged. If the patient has lost a tooth previously, and, when the pieces of the broken jaw are brought together, there is a deficiency or irregularity in the teeth, then a piece of cork may be adapted to the teeth of each side, in such a manner as to serve the purpose of a splint." † Here we see the intervention of cork is approved of on the principle of its affording an even surface, against which the line of teeth in the lower jaw may rest. And as Mr. Bell thus advises the practice when the teeth are defective and irregular, and in the next page, when they are so perfect, as to leave no interstice through which the food can be put

* Delpsch *Precis des Mal. Chir.* t. i. p. 396.

† *Operative Surgery*, vol. ii. p. 221. 8vo. Lond. 1800.

into the mouth, he is to be considered as an advocate for this method in all cases. *

When the neck of the condyle is broken little can be done, except keeping the bone steadily supported with a four-tailed bandage. Here I should conceive the interposition of cork between the teeth might be dispensed with, though Delpach is an advocate for its employment.

The extreme part of the condyle, after separation from the rest of the bone, has sometimes been destroyed by necrosis. In general, however, all injuries of the lower jaw-bone, about the condyles, terminate without any ill consequences.

Sometimes the artery, running in the *canalis mentalis*, is ruptured, and the hemorrhage is copious. I have never seen a case, however, in which the bleeding did not cease, on the fractured ends of the bone being placed in a state of apposition.

It is scarcely necessary to observe, that the patient must avoid talking, chewing, and indeed all motion of the jaw. His food should be so soft, as not to require mastication, and it ought to be put into his mouth with a small tea-spoon. In bad cases, all nourishment and medicines might be introduced into the stomach through a hollow bougie, passed through one of the nostrils, by which means the hurtful movement of deglutition might be avoided.

The lower jaw-bone being highly vascular, its injuries are generally repaired with surprising quickness. In adults, three weeks commonly suffice for the union of its fractures; and in children a fortnight. In compound, or comminuted fractures of the lower jaw, however, necrosis of large portions of the bone sometimes ensues, and the exfoliations take up considerable time. Sometimes, after fractures of the chin, various nervous symptoms, and paralysis of certain muscles of the face, are the consequence, owing to the injury done to the inferior maxillary nerve. In one case where the patient had been carried off by fever, delirium, convulsions, &c. Flajani dissected the parts, and found the nerve lacerated just at its exit from the *canalis mentalis*. †

* "But, if the teeth be altogether perfect, in that case, rather than that he (the patient) should have to live altogether on liquids, the cork splints may be laid along the teeth, which, while they give firmness to the bandaging, allow an interstice in front for giving food." This sentence is rather badly constructed; but, I trust, it has been interpreted according to the author's meaning. C. Bell, vol. cit.

† Flajani, *Collezione d'Osservazioni e Riflessioni di Chirurgia*, tomo iii. p. 167, Roma, 1802.

FRACTURE OF THE CLAVICLE.

The exposed situation, and natural slenderness of this bone, render it very liable to be broken, either at its middle, its sternal, or its scapular extremity. Its middle part, however, where its curvature is greatest, most frequently suffers.

Fractures of the clavicle, besides being oblique, or transverse, may be divided into two different kinds, according as they happen to be situated at some point between the coracoid process of the scapula and the sternal extremity of the clavicle; or more towards the scapular end of the bone.

The first case is most frequently the consequence of a fall upon the outer part of the shoulder, or upon the palm of the hand; for, anatomy teaches us, that the clavicle receives the impulse of every force, which is applied to the whole upper extremity. The second kind of fracture is generally produced by a blow directly on the part, and is attended with but a very trivial displacement of the fragments. On the contrary, in the former case, the displacement is very conspicuous; being caused by the weight of the arm, and the action of the pectoralis major and latissimus dorsi. Hence, the shoulder is depressed nearer to the trunk; the arm falls downwards and inwards; the inner end of the fracture is made to project partly by the action of the sterno-cleido-mastoideus, but chiefly by the external portion of the bone descending below it, the latter being displaced in the direction downwards, inwards, and forwards. In general, the fragments are still in contact, but, in such a manner, that the extremity of the outer piece touches only the lower side of the sternal portion.

Fractures of the clavicle are not commonly attended with any bad symptoms, arising from the injury of the neighbouring parts by the fragments of bone: at least, the case is generally exempt from any evils of this kind, when the accident has been produced by some force applied to the arm, or outer part of the shoulder. When, however, the violence has been directed immediately upon the bone, and has had a share in increasing the displacement of the fragments, the external portion may be forced against and even wound the axillary vessels and nerves, or its point be driven through the integuments. It is also under such circumstances, that a spicula of the bone may prick the lungs, and be followed by emphysema.

The symptoms of a fracture of the clavicle are, pain at the injured part; all motion of the arm difficult, but not very painful; impossibility of raising the hand to the head; the

arm hangs close to the side, and is rotated inwards; the shoulder is lowered, and drawn towards the median line of the body; the head is inclined towards the injured shoulder; the patient supports the weight of his arm with the hand of the sound side; the internal fragment projects upwards and backwards; the external is situated below it, directed downwards and forwards; the natural position of the shoulder may be restored by taking hold of the upper part of the humerus, and carrying it upwards, backwards, and outwards, which manœuvre also puts the ends of the fracture in due contact, and sometimes produces a crepitus; lastly, the displacement returns immediately the arm is left unsupported.

Fractures of the middle or inner part of the clavicle are rarely united, without some degree of deformity being left; but those which happen towards the acromion are both more easily and more perfectly cured.

In the treatment, the indications are to keep the shoulder elevated, inclined away from the trunk, and, at the same time, drawn backwards. Indeed, as the extremity of the internal fragment is pulled somewhat upwards by the sterno-cleido-mastoideus, the shoulder should be raised even higher than natural. The apparatus should completely take off the weight of the arm, and continually act with an equal force, so as to keep the shoulder regularly in one position; while the parts, with which the clavicle is articulated, should be kept perfectly motionless. *

It must be acknowledged, that the completion of all these objects is attended with considerable difficulty. However, the plan adopted by Desault fulfils each indication nearer than any other method hitherto devised, and consequently ought to be preferred to the common practice seen in many of our hospitals.

In these, the principal reliance is placed upon the effect of a sling for supporting the arm, and upon a figure-of-eight bandage, with which the shoulders are braced back, a bit of soap-plaster being usually applied over the fracture under the bandage, and some tow, or other soft materials, interposed between the margins of the axillæ and the turns of the roller, in order to prevent chafing. An assistant is first directed to draw the shoulders firmly back, while another assistant keeps the arm and shoulder steadily raised. The surgeon then examines, whether the ends of the fracture are brought together, and if they appear to be so, he applies the

* Delpech, Précis des Maladies Chir. t. i. p. 248.

piece of soap-plaster to the skin over the fracture, and then the figure-of-eight bandage. Lastly, the whole arm is kept well up and at rest in a sling.

Though compresses, applied above the fracture, appear more likely to do harm than good, a skilful surgeon might perhaps derive aid from them in difficult cases, were he to place them judiciously just under the external fragment and above the internal one, but never exactly over the ends of the bone.

I am decidedly of opinion with Desault*, that the figure-of-eight bandage is not altogether well calculated for fractures of the clavicle, particularly such as are attended with displacement. The outer portion of the bone is thrown downward and forward, and is already situated too much inward, in which latter direction, the above bandage must push it still further. Hence, the advantage of placing a cushion just under the arm-pit, and keeping the elbow closely confined by the side of the body, in the manner practised by that eminent surgeon.†

FRACTURES OF THE SCAPULA.

The greatest part of the scapula, being well covered with flesh, is not easily fractured. The acromion is the part which is most exposed, and most frequently broken; but the body, spine, coracoid process, neck, glenoid cavity, and the superior or inferior angle of this bone, may be similarly injured.

When the acromion is broken, the solution of continuity mostly happens across its base. The external fragment is drawn downwards by the weight of the arm, through the medium of the deltoid muscle. The displacement, however, is not very considerable, amounting merely to a simple inclination of the point of the bone downwards; a change, which may be rectified either by raising the arm from the trunk, or elevating it in a parallel line to its axis. These circumstances, together with the crepitus, suffice for denoting the nature of the accident.

Fractures of the acromion may generally be cured, without any deformity, either by keeping the humerus close to the side, raised in a line parallel to its axis, or by placing and maintaining it at nearly a right angle to the trunk. In the first

* *Cœuvres Chirurgicales*, par Bichat, tom. i.

† In a very difficult case, a mechanical apparatus, with broad leather straps for confining the shoulders back, would be better than a roller; but, not free from the disadvantage of pressing the outer fragment still more inwards.

case, it is necessary to interpose between the arm and the side a cushion, which is thicker below than above, because a very close approximation of the elbow to the body has a tendency to bring on a displacement of the outer fragment of the bone, by rendering the deltoid muscle tense. The head of the humerus should also be kept well up against the acromion, an object, which may be fulfilled by means of a good sling, and a bandage extending from the elbow on the injured side over the opposite shoulder. The difficulty, however, of maintaining the arm constantly in the right position, unless the patient be confined in bed, is generally acknowledged, and, as Delpech remarks, the requisite apparatus would often be found extremely inconvenient for young women. Hence, this surgeon expresses his preference to the method of keeping the patient quiet in bed, with the arm separated from the side, so as to relax the deltoid, in which state, he conceives, that the fibres of the trapezius would act usefully in bringing up the outer piece of bone to a level with the clavicle.*

A vertical fracture of the body of the scapula is attended with a fixed pain in the situation of the injury; a manifest crepitus on moving the arm; and more or less deformity in the course of the spine of the bone. As there is no displacement of consequence, no reduction is necessary, and the only essential treatment consists in preventing the fragments from moving about by keeping the arm confined close to the side, during the time required by nature for the completion of the union.

Transverse fractures of the body of the scapula seldom occur above its spine. Occasionally, they take place so low down, as to detach the lower angle, the fissure extending more or less upwards to the front, or outer edge of the bone. When the scapula is broken transversely near its spine, the action of the serratus major anticus is the principal means of disturbing the fracture, the lower fragment alone being displaced horizontally and forwards. In a transverse fracture, near the angle, the latissimus dorsi may have a share in producing the displacement of the lower fragment, which is also drawn forwards and upwards by the action of the teres major.

As transverse fractures are always attended with displacement, they may be easily detected.

When the bone is thus broken low down, where the teres major is the chief cause of displacement, the arm should be

* Delpech, *Traité des Maladies Chir.* t. i. p. 242.

confined in a sling close to the side, with the elbow a little inclined backwards. In other cases, the shoulder should be kept downwards and forwards; but this position being irksome, and no good apparatus being invented for preserving it, the practical surgeon is obliged to be content with applying a piece of soap-plaster, the spica bandage, and a sling for keeping the arm at rest, which last is the only very useful measure.

In fractures of the coracoid process, the arm should be put in such a position as will relax the coraco-brachialis muscle, a tense state of which must produce displacement of the detached point of that process. The humerus should therefore be inclined towards the sternum, and confined in this situation by means of a sling and a roller. When the neck of the scapula is broken, the glenoid cavity, and os brachii, fall downwards, and a crepitus is usually felt on raising the limb, which descends again immediately it is left unsupported. The evident indications are, to keep the elbow and whole arm properly elevated in a sling, and to forbid all exercise of the limb. A piece of soap-plaster, a compress, and a spica bandage, may also be applied to the shoulder. The chief dependance must be upon the sling, which serves for keeping the arm quiet, and the detached portion of the neck of the scapula, as high as the part, from which it has been separated.

The spica bandage, usually employed in fractures of the scapula, is used rather for its neat appearance, than real efficacy. The middle of a double-headed roller is put under the arm-pit of the sound side; the bandage is then carried obliquely upwards both over the breast and back to the injured shoulder, where its two parts are made to cross and lie smoothly over each other. They then cross under the arm-pit below, whence they ascend to the top of the shoulder, and again crossing, follow the course already mentioned over the back, breast, and shoulder, once or twice more, the application being at last generally completed by a turn or two round the chest, including the arm, or not, as the circumstances of the case may require. In injuries of the scapula, this last proceeding of including the arm, and thus confining it close to the side, is generally the most useful operation of the spica bandage.

FRACTURES OF THE STERNUM.

The sternum being suspended, as it were, between the elastic cartilages of the ribs, cannot very easily be broken: the accident, however, is sometimes produced by violent blows,

or the passage of the wheel of a carriage over the chest. When the bone is fractured, the thoracic viscera also generally suffer more or less injury. In some cases, the fracture consists of a single fissure; in others, the bone is broken in several places, and the fragments may be displaced by the same force which caused the injury.

Fractures of the sternum are most frequently transverse, and as its lower part, and the inferior ribs attached to it, have the greatest degree of motion, the lower fragment is often displaced, and being propelled forwards in inspiration, projects more than the upper one, and even overlaps it, so as to cause a permanent kind of displacement. As Delpsch observes, independently of the injury which the thoracic viscera may have sustained, and its serious consequences, the displacement of the bone, here alluded to, may give rise to very alarming symptoms, and this sometimes after the union of the bone has been effected with the fragments in such an unnatural relation to each other. A series of dangerous symptoms may also result from the sharp splinters of the bone being forced inwards.

As the sternum is very superficial, its fractures are readily detected by manual examination; and, when the pieces are at all separated, the deformity is quite obvious at the first glimpse. When such displacement does not exist, each movement of respiration is attended with a crepitus, which the patient is conscious of himself, and the surgeon can easily perceive. A fixed pain is also experienced in the part, and is exasperated by the movements of respiration; while, in consequence either of the displacement of the fragments, or the contusion of the internal organs, the patient suffers great oppression, palpitations, and a troublesome cough. When the lungs are wounded by the spiculæ of depressed bone, the patient expectorates blood, and emphysema may follow.*

When a fracture of the sternum is attended with a depression of a portion of the bone, the urgent symptoms, thus produced, may require a prompt elevation of the part beaten inward. But, how is this object to be accomplished? In truth, it is generally a matter of considerable difficulty. It is alleged, that a reduction has been sometimes produced by a fit of coughing. Whether this is a common event, I know not; but it is clear, that if the displacement continue, the making of such extension of the bone, as would allow the pieces to be placed

* Flajani, *Collezione d'Osservazioni e Riflessioni di Chirurgia*, t. iii. p. 214. Osserv. 52.

evenly together, cannot be a very practicable undertaking. However, surgical writers are always fertile in contrivances under the greatest difficulties, and in this case, they recommend the attempt to extend the spine considerably backwards, by placing under the patient's back, while he is lying horizontally, a cushion of greater or lesser thickness. When this method fails, and the symptoms are urgent, an incision is advised to be made down to the bone; and, if the depressed portion of the fracture cannot be raised by means of an elevator, or the forceps, it is to be removed either with a trephine, or one of Mr. Hey's saws. Delpech conceives, that the employment of saws will scarcely ever be necessary, as the soft spongy texture of the bone would make it easy for the surgeon to cut, or scrape away a part of the anterior fragment.

Fractures of the sternum being mostly complicated with injury of the thoracic viscera, are generally to be regarded as cases attended with a considerable risk, either from extravasation of blood in the chest, emphysema, the subsequent inflammation of the pleura and lungs, abscesses in the anterior mediastinum, or necrosis of portions of the injured bone itself. It is these latter effects, viz. abscesses and exfoliations, which more frequently call for the use of the trephine, than mere depressions of the broken bone.

If any cases in surgery demand copious venesection, fractures of the sternum, and injuries of the thoracic viscera, will be allowed to do so: indeed the lancet should be used freely and repeatedly, according to the urgency of the symptoms; other antiphlogistic measures being also rigorously practised.

With respect to an apparatus for diminishing the movements of the ribs and broken sternum, none is better, than a broad roller tightly applied round the thorax, or a strong napkin laced well round the same part of the body. In this state, respiration will be chiefly carried on by the alternate action of the diaphragm and abdominal muscles, while the ribs and sternum continue motionless.

FRACTURES OF THE RIBS.

The upper ribs are not often broken, on account of their guarded situation beneath the clavicle and shoulder; while the false ribs are seldom fractured, because their great moveableness makes them elude the effect of external violence. The middle ribs are by far the most frequently broken. When the force is applied by a broad surface, it is not uncommon for two or three of the ribs to be fractured. These injuries are

rarely attended with any material displacement, the intercostal muscles tending to hinder a permanent separation of the fragments. The injury is most commonly situated near the greatest convexity of the bone. The surgeon should place his hand on the part where the patient complains of a pricking pain, or where the blow has been received; and then the latter should be desired to cough, in which action, the ribs must necessarily undergo a sudden motion, and a crepitus thereby be likely to be rendered perceptible. However, all the best practical surgeons are in the habit of adopting the same treatment when there is reason to suspect a rib to be fractured, as when the injury is actually known to exist, by a crepitus, or an irregularity of the bone.

When the point of a fractured rib is beaten inward, a train of alarming symptoms may ensue, as for instance, extravasation of blood, emphysema, and inflammation of the pleura and lungs.

Except when urgent symptoms arise, the treatment of fractured ribs is a business of great simplicity. The principal indication is to render the injured bone or bones as motionless as possible, during the cure. For this purpose, after a piece of soap-plaster has been applied over the fracture, a tight broad roller is to be put round the thorax. However, as a roller is liable to become slack, it is generally better to get a piece of strong linen, sufficiently large to surround the chest: this cloth is then to be made to compress the ribs, by lacing it with proper tightness. When the bandage has been applied, the patient should be immediately bled, and put on a rigorous antiphlogistic plan.

Should a troublesome cough prevail, and seriously disturb the fracture, the spermaceti mixture, with opium, must be exhibited.

The cartilages of the ribs, as experience proves, are also subject to fracture, and, what is remarkable, the union is never effected through the medium either of a cartilaginous or any other soft substance, but of an osseous matter.* The treatment is the same as that of a fractured rib.

FRACTURES OF THE VERTEBRÆ.

The spinous, oblique, and transverse processes, and even the bodies of the vertebræ, are sometimes fractured. Such an injury of one or more of the spinous processes may generally

* Delpech, *Traité des Maladies Chir.* t. i. p. 238.

be felt with the finger. Fractures of the more deeply situated parts of the vertebræ can hardly be detected with certainty: for the parts themselves cannot be examined, and the various symptoms which usually occur, are not calculated to dispel all doubt, inasmuch as they may originate from a simple concussion of the spinal marrow. A blow, which has not been violent enough to break the vertebræ, may be sufficiently powerful to cause either a very dangerous commotion of the delicate production which they contain, or an effusion of blood within the theca, or the substance of the medullary matter itself.* We read of incisions being made, and of the fragments of bone, causing pressure on the spinal marrow, being elevated and extracted; but, what considerate surgeon would venture to imitate such practice?

Here I am disposed to think with a modern writer, that an incision through the skin and muscles covering the spine, and the withdrawing of a portion of the circle of bone, which surrounds the marrow, would be inevitably fatal.† Where the patient is not quickly destroyed by the paralysis induced in the diaphragm and other important organs, or by the case being complicated with rupture of the kidneys, spleen, &c. and internal hemorrhage, I know of no treatment which holds out any prospect of efficacy, except the free use of general and topical bleeding, with a view of preventing inflammation, and suppuration within the spinal canal. In conjunction with this plan, other antiphlogistic means must be employed, and, above all things, the patient kept perfectly quiet in one position. The difficulty of voiding the urine is to be obviated by the catheter. Should the patient live long enough to justify the inference, that the fracture is united, though some of the paralytic effects of the injury still remain, stimulating liniments, blisters, and issues‡ may be tried.

One or more of the spinous processes are sometimes broken, without the spinal marrow receiving any particular injury; but, other fractures of the spine are mostly attended with a train of dangerous symptoms, all the parts situated below the injured point being generally affected with partial or complete paralysis. As Mr. C. Bell observes, when the fracture is low, it is attended with loss of sensibility and motion in the lower extremities, and paralytic disorder of the bladder; when the injury is higher up, the abdomen suffers more distention;

* Delpech, vol. cit. p. 230.

C. Bell, vol. cit. p. 156.

† Ibid. p. 160.

when it is still higher, respiration is affected ; and, when it is above the principal origin of the phrenic nerve, the breathing is stopped, and death suddenly follows.* With the exception of the spinous processes, the several parts of the vertebræ are so protected by their deep situation, that they cannot be broken without the application of immense violence, and hence the fracture is mostly accompanied with other injuries of quite a different nature, and sometimes even more surely fatal. Experience proves, indeed, that when the spine is broken, the accident is generally produced by the patient falling from a very considerable height, and the back-bone striking with vast force against some hard projecting body. The violence of such a blow not only breaks the vertebræ, and causes injury of the spinal marrow, but gives rise to a copious extravasation of blood in the cellular membrane, and even within the cavity of the abdomen from rupture of the spleen, kidney, or other viscera.†

Were it in the surgeon's power to detect with certainty a fracture of the corpora vertebrarum, or of the oblique or transverse processes, he would not be able to apply the information to any practical purpose, nor make the least alteration in the plan of treatment. Any change in the position of the fragments could never be attempted, first because the practitioner is always ignorant of their precise situation and position, has no means of acting directly upon them, and, were there such means, he must be a bold man to employ them, as any motion of the broken part of the spine might at once destroy the patient by an unfortunate compression of the medulla spinalis.

In fractures of the spine, I believe the surgeon cannot adopt with safety any measures which have for their object the reduction of the fragments.

FRACTURES OF THE BONES OF THE PELVIS.

On account of the great strength, and deep situation of the bones of the pelvis, they are seldom fractured, and when such an accident does happen, the violence is so considerable, that it must do vast mischief both to the external soft parts, and the internal viscera. One of the worst complications is injury of the spinal marrow and sacral nerves.

* Surgical Observations, vol. i. p. 150.

† See the fatal case recorded by Flajani, Collezione d'Osservazioni e Riflessioni di Chirurgia, Osserv. 47. tom. ii. p. 231.

The upper part of the os sacrum can rarely be broken, on account of its remarkable thickness; but, by great violence it is sometimes disjoined from the ilium.

The os ilium is said to be more liable to fracture, than any of the other bones of the pelvis. The rami of the ischium and pubes are also occasionally broken. Fractures of the os innominatum may be mistaken for dislocations of the thigh-bone; for, as Mr. A. Cooper remarks, when the injury extends through the acetabulum, the head of the os femoris is drawn upwards, and the trochanter somewhat forwards, so that the leg is shortened, and the knee and foot are turned inwards. If the os innominatum is disjoined from the sacrum, and the ossa pubis and ischium are broken, the limb is slightly shortened; but, the knee and foot are not turned inwards. Such fractures may be known by a crepitus, which is felt on applying the hand to the crista of the ilium, and moving the thigh, which can also be more easily moved about, than in a dislocation. In one example of fracture of the acetabulum, the head of the thigh-bone had sunk deep into the cavity of the pelvis.*

The pressure of the pelvis between a cart-wheel and a wall; the passage of a heavily loaded waggon over that part of the body; falls from great heights against very hard bodies; and gunshot violence†; are the ordinary causes of these accidents.

In most fractures of the pelvis, the pieces of bone are not displaced, and of course no reduction is needed. At the same time, the surgeon has an important duty to perform, which consists in taking every possible precaution to avert a train of dangerous consequences. Rest, copious bleeding, fomentations, low diet, and every thing calculated to prevent an alarming attack of inflammation within the pelvis and abdomen, are to be rigorously put in practice. Perfect quietude, however, it is difficult to obtain, on account of the patient being obliged to attend to the calls of nature. As Delpsch remarks; therefore, the very ingenious machines which have of late years been devised for the purpose of lifting patients out of their beds without any jolting, or deviation from the horizontal posture, cannot be too much commended; in fact, by their

* See A. Cooper's Surgical Essays, Part i. p. 49—51.

† In the neighbourhood of Antwerp, I saw a case, in which the explosion of a shell broke the tuberosities and rami of the ischium, dreadfully mangled the soft parts, and fractured one of the thighs. The unfortunate patient, who was a man belonging to the guards, did not survive this dreadful injury more than twenty minutes.

assistance, a bed-pan may be put under the patient, and his bed made, without any disturbance of the injured parts. *

In most fractures of the bones of the pelvis, it may become necessary to use the catheter, in consequence of the patient's inability to void his urine. As the lower extremities are also often paralytic, and the patient subjected to long confinement in nearly the same posture, too much care cannot be taken to prevent gangrene of the parts of the body on which he lies.

FRACTURES OF THE OS BRACHII.

These cases are distinguished, first into those which happen above the insertion of the deltoid muscle; secondly, those which occur below that point; and thirdly, such as take place towards the lower end of the bone.

In the first example, the pectoralis major, latissimus dorsi, and teres major, draw the upper fragment inwards; while the deltoid pulls the lower one outwards.

In the second instance, the displacement happens in the inverse of the former manner.

In the third, if the fracture be not situated in the broadest portion of the humerus, but where the bone is covered by the triceps and brachialis, without their being attached to it, the ends of the fracture may be displaced in any direction by external force. On the contrary, if the injury be very near the elbow joint, the displacement can only happen backwards or forwards, on account of the considerable transverse extent of the bone at this point, and the resistance of the muscles of the forearm, which almost all arise from the external and internal condyles, and of course are connected with both the fragments. The lower one is mostly found drawn forwards and rotated outwards.

A fracture of the head of the bone can only be distinguished by a very careful examination; but, when any other part of the os brachii is broken, the case is in general plainly indicated by the grating of the surfaces of the fracture against each other, the inability to use the arm, and the manifest change in its figure. The ends of the broken part may be in contact with each other; or they may be drawn asunder, and the limb be more or less shortened. When the lower end of the fracture is retracted, the biceps muscle, brachialis internus, and coraco-brachialis, are to be relaxed, and moderate exten-

* Delpech, vol. cit. p. 240.

sion made; but, in consequence of the extension of the forearm, it is sometimes drawn forwards and rotated outwards. When the external, or internal, condyle is fractured, the muscles, arising from the part, should be relaxed; a piece of soap-plaster, a figure-of-eight bandage, and a splint, to the side of the arm, on which the injury is situated, should be applied, and the forearm placed in a sling. The external condyle cannot be broken, without the fracture communicating with the joint, and, in every instance in which there is reason to suspect this event, it is necessary, after all risk of inflammation is past, to move the joint occasionally, in order to prevent the formation of adhesions within the capsular ligament, and an irremediable stiffness of the articulation.

In ordinary fractures of the arm, it is usual to apply two pieces of soap-plaster, which together surround the limb, at the situation where the accident has happened. Extension, if necessary, being now made by an assistant, who at once draws the lower portion of the bone downward, and bends the elbow, the surgeon is to apply a roller round the limb. The external splint is to extend from the acromion to the outer condyle, and being lined with a soft pad, the wood cannot hurt the limb by pressure. The internal splint is to reach from the margin of the axilla to a little below the inner condyle, and is to be well guarded with a pad, filled with tow, or any other soft materials. Some surgeons are content with the application of two splints; but, though the two above-described are those on which we are to place the greatest reliance, as the cylindrical form of the arm conveniently allows us completely to enclose this part of the limb in splints, I see no objection to the employment of four; one on the outside, one on the inside, one on the front, and another on the back of the arm. These are to be carefully fixed in their respective situations with tape.

When the humerus is fractured near or above its tuberosities, the art of surgery is not yet provided with any means, which will act upon the upper fragment. Here the only useful measures are to keep the arm well supported, and perfectly quiet in a sling, to confine the member close to the side, and make the patient avoid moving about. For the sake of appearances, the spica bandage and a soap-plaster might be applied to the shoulder.

Although fractures of the os brachii are generally cured with great facility, experience proves, that it is the bone, which more frequently fails to unite, than any other. When the fracture is oblique, and situated precisely at the part of the bone where the pectoralis major, latissimus dorsi, and

teres major are inserted, such failure is observed to be most disposed to happen, and the circumstance is accounted for by the fragments being drawn away from each other forwards and backwards by the action of the foregoing muscles, combined perhaps with that of the deltoid.

FRACTURES OF THE FOREARM.

The radius and ulna may be broken at their middle, or extreme portions; and the injury most frequently happens to the radius. The latter circumstance is accounted for by the different relations of these two bones to the hand, and by the naturally curved form of the radius. They are both most liable to be broken at their narrowest parts, and hence, when fractured together, the injury seldom happens at a parallel point of the two bones. In some instances, however, the radius is broken at its lower end, and the ulna at its upper one. When the radius breaks, it is mostly from a fall on the hand, but, when the ulna alone suffers, or both bones are fractured together, it is generally in consequence of violence applied directly to the forearm.

In fractures of the forearm, the fragments are generally displaced, both with regard to the diameter and direction of the injured bone. The ends of the fracture are mostly inclined towards the centre of the limb. It is to be observed, however, that the upper portion of a broken ulna is not susceptible of this kind of displacement, on account of the manner in which it is articulated with the humerus. When both bones are broken, the member is sometimes bent forwards, or backwards; but, though such a fracture may be oblique, the ends seldom ride over each other; a kind of displacement, which Delpech conceives is probably hindered by the interosseous ligament. In fractures of the thick portion either of the radius, or ulna, very little displacement is generally noticed. *

Fractures of the radius are easily detected; for, on endeavouring to rotate the bone, or, in other words, to place the hand alternately in a prone and supine posture, a crepitus is immediately perceptible. When the two bones are broken, the nature of the accident is indicated both by the crepitus and the distortion of the forearm. Fractures of the ulna, especially when high up, are not always immediately obvious. However, if the surgeon make pressure on each side of the

* Précis des Maladies Chir. t.i. p. 259.

suspected point, with his thumbs alternately, he will generally distinguish a grating sensation.

Fractures of the bones of the forearm, when unskilfully treated, are sometimes followed by one serious consequence, viz. the fragments unite and become consolidated, while displaced towards the centre of the limb; the two bones become connected together; no intervening space is left; and the movements of pronation and supination are for ever lost.

The prevention of the foregoing evils is one of the chief objects to be attended to in the treatment. As the fragments do not pass over each other, scarcely any extension is necessary for their reduction; but, the surgeon must incline them away from the interosseous space by pressure gently exercised on the dorsal and palmar sides of the limb.

During the treatment, the elbow is to be bent, and the hand put in the mid-state, between pronation and supination; that is to say, the palm of the hand is to face the patient's breast. After the reduction, a piece of soap-plaster is to be applied, and over this a slack roller. No one can doubt, that tight bandages may act very perniciously upon fractures of the forearm, by pressing the radius and ulna together, causing them to grow to each other, or, at all events, making the fracture unite in an uneven manner. In France, the surgeons usually make their apparatus have a tendency to preserve a due space between the two bones, and for this purpose they lay graduated compresses under the roller along the line corresponding to the interosseous space, on both sides of the forearm. When this mode is adopted, the roller may of course be rather more closely applied. Only two splints are necessary; one is to be placed along the inside, the other along the outside of the forearm; and soft pads must be interposed between the skin and the splints, in order to obviate the pressure of the hard materials, of which the latter are formed. The inner splint should extend to about the last joint of the fingers; but, not completely to the end of the nails; for, many patients, after having had their fingers kept for several weeks in a state of perfect extension, have been a very long time in regaining the power of bending them well again.

FRACTURE OF THE OLECRANON.

The olecranon may be broken by falls, or blows upon the elbow, or by the violent action of the triceps muscle; the injury may take place at various distances from the extremity of this process; the solution of continuity may be single; or

the part may be broken into several pieces. In consequence of the action of the triceps and the effect of bending the elbow, the detached fragment of a broken olecranon would always be drawn up a considerable distance from the rest of the bone, were it not for the aponeurosis, which is extended from the tendon of the triceps over the posterior surface of the olecranon; for, it mostly happens, that this tendinous expansion is not ruptured, or, at all events, not completely; and what remains entire has the effect of limiting the separation of the fragment or fragments from the main part of the bone. *

The member having been slightly bent, a pad filled with tow, and thicker in its centre than at its ends, in order to fill up the hollow in front of the elbow, is to be laid along the forepart of the arm and forearm, and then a splint is to be put over it, and fixed (but not too tightly) with a common roller. When the inflammation of the soft parts is very considerable, I think the immediate use of the bandage and splint should be deferred for a few days, until the swelling has been diminished by leeches, venesection, cold applications, and other antiphlogistic remedies. Were the fascia derived from the tendon of the triceps, entirely lacerated, and the fragment of bone drawn very far up the arm, it might be necessary to have recourse to a compress and bandage for hindering such retraction; but, in this case, the movements of the elbow after the cure would probably be somewhat weak and imperfect.

One would suppose *à priori*, that the treatment must consist in relaxing the triceps and anconæus, by placing the arm in an extended position; in pushing downward, and replacing, the detached part of the olecranon; in confining it there with compresses and a circular bandage, applied immediately above the point of the broken process; and in maintaining the arm, extended by means of a splint, put in front of the arm and forearm. Experience appears to determine, however, that keeping the limb so much extended has a bad effect, the cure being less perfect, the fragment more irregularly united, and the future movements of the joint less free, than when the elbow has been allowed to be slightly bent during the treatment.

When the arm is too much extended, the detached portion of the olecranon is pushed from its notch in the lower head of the humerus, and, consequently, it does not perfectly and correctly unite with the body of the ulna. In the natural

* Delspech, vol. cit. p. 262.

state of the joint, the passage of the olecranon into the hollow of the humerus confines the extension of the forearm within due limits; but, if such check be removed, as Mr. C. Bell conceives, the forearm may be bent back too far, and the ligaments strained.

On the other hand, if the forearm be not enough extended, when the bone is set, the olecranon may project too far after the cure, and come into contact with the humerus, before the limb is completely extended. *

Sometimes, in consequence of a great deal of swelling of the soft parts, a fracture of the olecranon remains undetected; but, the pain and soreness making the patient keep the limb quiet, the fragment unites to the rest of the bone, by means of a fibrous ligamentous substance. Notwithstanding this mode of union, the triceps has been observed to retain its full power of extending the forearm.

At present, I think the best practitioners agree, that it is most advantageous to let the elbow be a little bent, to adopt measures calculated to repress inflammation, and to begin to move the joint gently as soon as the swelling and inflammation have subsided, and the uniting fibrous substance is strong enough safely to admit of this exercise. No general rule can be given on this point; but, perhaps, it is a good maxim not to begin to move the joint, until all inflammation has disappeared.

FRACTURES OF THE METACARPAL BONES, AND FINGERS.

The metacarpal bone of the little finger is said to be most frequently broken. In the treatment of fractures of the metacarpal bones, the essential object is to keep the adjacent joints perfectly motionless. For this purpose, the hand is to be placed upon a flat splint or hand-board, betwixt which and the palm, a suitable pad is to be put. A piece of soap-plaster is now to be applied to the part, and the splint having been secured with a bandage, a sling is to be worn. When the fingers are fractured, surgeons are usually content with keeping the part steady with longitudinal pieces of pasteboard put over the soap-plaster, along each side of the finger, and fastened with tape. During the treatment, the hand and forearm should be kept in a sling. Some surgeons are in the habit of confining with pasteboard and tape, not only the broken finger, but the adjoining one on each side.

FRACTURES OF THE THIGH-BONE.

A fracture of the thigh-bone is attended with the following symptoms: severe local pain at the instant of the accident;

* C. Bell's Operative Surgery, vol. ii. p. 182, 183.

sudden incapacity to move the limb; a *crepitus*, which is sometimes very distinct on moving the ends of the fracture; deformity, which occurs in a triple relation to length, breadth, and direction. In regard to this latter diagnostic mark, viz. the deformity, it is necessary to have very precise ideas; for, as it has a continual propensity to take place, especially in oblique fractures, its prevention is the chief object in the treatment.

By far the majority of fractures of the thigh are attended with deformity; a few transverse cases, and others situated near the condyles of the *os femoris*, being the only exceptions. These last examples, however, are sometimes oblique, in which circumstance, a degree of displacement may happen, and, if not carefully rectified, the condyles will remain in a distorted position after the cure, and the knee joint be weakened and deformed. If we consider the deformity, in regard to length, we find, that, in oblique fractures, the limb is constantly shorter than that of the opposite side, a circumstance plainly indicative of a displaced state of the ends of the fracture. By examining the situation of the accident, we may easily ascertain, that the shortening of the limb arises altogether from the end of the lower portion of the bone being drawn upwards, beyond that of the upper fragment; which itself can undergo no retraction. The muscles are the only powers, which can cause this motion of the lower end of the fracture, from below upwards. On one side attached to the pelvis, and, on the other, to the patella, tibia, and fibula, they make the former their fixed, and the latter their moveable point; and drawing upwards, inwards, and backwards, the leg, the knee, and the lower portion of the *os femoris*, they produce the displacement of the fracture: the principal agents being the triceps, semitendinosus, semimembranosus, rectus, gracilis, biceps, &c.

This kind of displacement is facilitated by the effect, which the glutæi, psoas, and iliacus internus have in drawing the upper fragment outwards and forwards; an effect, which would happen in a still greater degree, were it not in some measure counter-balanced by the action of that portion of the triceps, which continues attached to the upper piece of the broken bone.

In Desault's works *, a case is mentioned, which affords a striking illustration of the power of the muscles to produce derangement of the ends of a fracture. A man broke his thigh; but, the ends of the bone were not at all displaced, though the fracture was oblique. This unusual circumstance was found to be owing to paralysis of the limb; and no sooner

* Tom. i. par Bichat.

was the latter affection cured, and did the muscles regain their power of contraction a few days afterwards, than the lower end of the fracture was drawn upwards, as in ordinary cases.

A fractured thigh is most liable to be followed by a permanent shortness of the limb, when treated on a bed, which is too soft and yielding. As the buttocks form a greater projection, than the other parts of the body, they soon cause a depression in the bedding, and hence a declivity of the surface on which the trunk lies, so that the body glides downwards, pushing in the same direction the upper end of the fracture, and making it pass beyond the lower one. The beds, therefore, on which broken thighs are placed, ought never to be filled with feathers, or other materials of too soft and yielding a nature.

Transverse fractures of the thigh, which are said to be more common in children, than adults and elderly persons *, are less liable than oblique cases to be attended with a shortening of the limb; because the surface of the upper end of the fracture makes mechanical resistance to the ascent of the lower portion of the broken bone.

The deformity of the limb, in regard to breadth, must necessarily accompany that in respect to length; but, it is quite obvious, that, in transverse fractures, the first sort of displacement may exist alone.

In Desault's works by Bichat, from which the preceding account is chiefly taken, it is next explained, how the deformity, in regard to direction, may result from the operation of the blow causing the fracture; from the awkwardness of those who carry the patient; or, from the bad position in which the limb is placed.

Besides the above kinds of deformity, the lower end of a fractured thigh-bone is ordinarily rotated outwards, an effect, which all the strong muscles have a tendency to produce, and which must always be increased by the weight of the leg and foot, when these are not adequately supported.

We may set it down as an invariable fact, that the higher a fracture is situated in the thigh-bone, the greater is the difficulty of keeping the fragments duly applied to each other. The reason of this circumstance is entirely owing to the additional number of muscles, which, in this kind of case, acquire the power of drawing upwards the lower portion of the broken bone; and it must be plain to any surgeon, who devotes the least consideration to the subject, that such muscles as have their insertion above the breach of continuity, can have no effect in displacing the fracture, in regard to the length of the limb.

* Delpsch, Précis des Maladies Chir. t. i. p. 267.

The muscles of children being weaker, than those of grown up patients, fractures of the thigh in young subjects, are generally observed not to be attended with so much displacement, as those occurring in adult persons, the limb being merely more or less bent backwards. This fact may also be accounted for on another principle, already suggested, viz. the less frequency of oblique fractures of the thigh in children, than in adults.

With respect to fractures of the neck of the thigh-bone, a few observations will be presently offered.

TREATMENT OF FRACTURED THIGHS.

Mr. Pott, seeing that the difficulty both in reducing displaced fractures of the thigh, and in maintaining the ends of the bone in a proper state of apposition, arose from the action of such muscles, as draw upwards the lower portion of the broken os femoris, introduced into practice the method of placing the limb in a bent position, by which, he conceived, the most powerful muscles were relaxed. The same position he recommended, both at the time of reduction, and during the subsequent treatment. According to Mr. Pott, the position of the fractured os femoris should be on its outside, resting on the great trochanter; the patient's whole body should be inclined to the same side; the knee should be in a middle state, between perfect flexion and extension, or half bent; the leg and foot lying on their outside, also, should be well supported by smooth pillows, and should be rather higher in their level, than the thigh. One very broad splint of deal, hollowed out and well covered with wool, rag or tow, should be placed under the thigh, from above the trochanter quite below the knee; and another, somewhat shorter, should extend from the groin below the knee on the inside, or rather in this posture on the upper side; the bandage should be of the eighteen-tailed kind, and, when the bone has been set, and the thigh well placed on the pillow, it should not, without necessity, be ever moved from it again until the fracture is united.*

Whoever peruses Mr. Pott's remarks on fractures with attention, will be led to think, that this eminent practitioner actually conceived, that the above position of the limb would relax every muscle connected with the broken bone; a thing, which is certainly not effected. But, I believe, that when the direction, in which the lower end of the fracture is dis-

* Some few general Remarks on Fractures and Dislocations, in *Chirurgical Works*, vol. i.

placed, is taken into consideration, viz. upwards, behind the upper portion of the os femoris; and when the muscles, which have the greatest tendency to produce this effect, are calculated; it will be granted, that the majority of such muscles, *as have the greatest influence over the fracture*, are more relaxed in the bent, than they are in the straight position of the limb. However, Mr. Pott, by the term *relaxation*, might possibly mean only a state, in which the muscles are not actually stretched, though the origins and insertions of many of them might be brought much nearer together.

After all that has been said and written upon this subject, it cannot be denied, that the bent position does not completely incapacitate the muscles from displacing the fracture, and, of course, every possible assistance ought to be derived from the splints and the rest of the apparatus. Nor will it be denied, that the bent position is attended with the great disadvantage of leaving the leg in a moveable, unsupported state; a consideration, in my mind, strongly against this mode of treatment, inasmuch as every motion of the leg creates the most hurtful disturbance of the fracture of the thigh. The bent posture may relax many of the most troublesome muscles; but, it cannot hinder all of them from disturbing the fracture, and it leaves the leg unfixed. The extended posture may not relax quite so many of the muscles, which tend to displace the fracture; yet, it affords an opportunity of applying splints to the whole limb, an object of the highest importance.

There is one part of the position, advised by Mr. Pott, for which I have never heard any reason assigned; and as the adoption of it seems to me likely to be detrimental, I cannot refrain from delivering my sentiments on the subject, though they may appear presumptuous. I allude to the direction to place the leg and foot rather higher in their level, than the thigh. Whoever has had opportunities of seeing many cases of broken thighs, must know, that, when the ends of the fracture are united, the toes are frequently turned more outwards, than is natural. Now, I conceive, that nothing has a greater tendency to promote the occurrence of this deformity, than twisting outward the lower portion of the broken bone, by elevating the leg and foot above the level of the thigh; and as this inconvenience does not seem to be counterbalanced by any manifest good, why should surgeons persevere in a servile adherence to what they do not understand?

Mr. Pott has mentioned only two splints: at present, whenever the bent position of the limb is chosen, a splint is usually laid along each of the four sides of the thigh. After duly placing the limb, the necessary extension is made.

Then the under splint, having upon it a broad soft pad, and an eighteen-tailed bandage, is laid under the thigh, from the great trochanter to the outer condyle. Before applying the soap-plaster, and other splints, the surgeon must of course take care, that the fracture lies as evenly as possible.

The position, recommended by Mr. Pott for a broken thigh, is disapproved of by many surgeons, first, because it leaves the knee at liberty to move about; secondly, because it is difficult to make the patient lie for any length of time exactly on his side; and lastly, because though the relaxation of the most powerful muscles may be advantageous, the half-bent position does not in reality incapacitate these organs to displace the two portions of the broken bone, and, therefore, every aid, which can be derived from mechanical means, should be employed, which it is impossible to do in the foregoing posture of the limb.

When, as a modern surgeon has remarked, the limb is merely laid on the outside, gently bent, and secured with splints and bandages, the body and limbs of the patient lie well for some little time; the thigh rests upon its outside, and the body is inclined the same way: but, by and by, the patient turns directly on his back, while the leg remains with the outside of the foot flat upon the bed. *

The author whom I have last quoted, recommends a modification of the bent posture, the peculiarity of the method consisting in the limb being placed upon cushions, which rest upon two boards, joined together at such an angle under the ham, that, when the patient lies upon his back, the hip and knee-joints will be in a moderately bent position. Near the edge of the inclined boards, there are holes made, and pegs of wood fitted to them. The limb is to be placed upon the cushions on the frame. The bone is to be set; and then one long splint is to be laid along the outside of the thigh from the hip to the knee; another upon the inside of the thigh; and over these, the eighteen-tailed bandage. If the board under the thigh be found too long, the hip is to be raised by placing a cushion under it; but, if the board be too short, the hip is to be allowed to sink as much as circumstances require, or the size of the pad under the knee is to be increased. In order to keep the foot from moving laterally, the edges of the cushions are folded up, and fixed by the pegs, by which means the sides of the whole limb may be supported from the knee to the ankle. †

* C. Bell's *Operative Surgery*, vol. ii. p. 191.

† A similar apparatus has been employed by Mr. Astley Cooper for nearly twenty years past. The first invention of the kind was made by Mr. White of Manchester, iron being used instead of wood. See *Surgical Essays*, Part ii. p. 49. 8vo. Lond. 1819.

Twenty years ago I saw used in St. Bartholomew's-hospital an apparatus calculated for maintaining the limb in the bent position upon the heel, calf, and under surface of the thigh, while the patient lies upon his back. It was a more complicated machine, however, than the preceding, and applicable either to Mr. Pott's, or the straight position, and either to cases of fractured thighs, or broken legs. It was an ingenious contrivance, which I remember used to be exhibited by Mr. Abernethy in his lectures. If my memory fail me not, it afforded a better support for the foot, than the frames employed by Mr. Astley Cooper and Mr. C. Bell, which appear to me to stand in need of a foot-board.

The bent position of the limb, however, is now abandoned by many judicious surgeons both in England and in France; and the straight, or extended posture adopted, which is certainly the most convenient for applying such an apparatus, as will afford support and steadiness to the whole member, and keep the knee and ankle-joints motionless. In this position, the chief reliance is upon two splints, one of which extends from the hip to the outside of the foot; the other from the space between the scrotum and the thigh down to the inside of the foot. The lower part of the external splint should be made to reach along the side of the foot, in order to afford support for a pad, which is to be placed there for hindering the foot from turning too far outwards.

For an account of the apparatus, employed by Desault, I must refer to the Dictionary: that of Boyer will be hereafter described.

Since experience proves, that no posture will suffice for hindering every muscle from having a tendency to displace a fractured thigh, several practitioners are yet inclined to believe, that the employment of permanent extension is a principle, which should not be relinquished in the treatment.* At all events, no doubt can possibly exist about the propriety of endeavouring to make the apparatus for a fractured thigh more perfect and efficient.

In common fractures of the thigh, Delpech expresses a preference to Boyer's apparatus and the extended position. There are two cases, however, in which he commends the bent posture. The first is when the bone is broken directly below the trochanters, in which event, the upper fragment is drawn considerably outwards and forwards by the psoas and iliacus internus, the action of which is here not at all counter-balanced by that of the upper portion of the triceps. Hence,

* Delpech, Précis des Maladies Chir. t. i. p. 269.

Delpech conceives, that the best plan is to relax the muscles, which displace the lower fragment, by which means it will more readily admit of being put into contact with the upper fragment.

The second example, for which Delpech thinks the bent position advantageous, is when the bone is broken immediately above its condyles. Here, the lower fragment is displaced by the action of the great muscles of the calf of the leg, which have the effect of drawing backward the upper end of the lower portion of the bone.

In both the preceding instances, however, he thinks permanent extension might prove useful: they are cases, in which, I conceive, the frames spoken of by Mr. A. Cooper and Mr. C. Bell, might be advantageous.

FRACTURES OF THE NECK OF THE THIGH-BONE.

Upon these cases I mean to detain the reader a little while, because the subject has not been so fully considered in the Dictionary as I could wish, and, what is now about to be said, must be regarded as essential additions to the account in the latter publication.

The causes of fractures of the neck of the thigh-bone are to be sought for, partly in the structure and conformation of this portion of the bone itself, and partly in the mechanical effect of external force.

In the first class of causes is to be comprehended the spongy structure of this part of the bone. Also, since in women the neck of the thigh-bone stands out nearly at a right angle, while in men it proceeds outwards in a sloping direction, it is more apt in the latter sex, than in females, to be broken by a fall upon the side. In consequence of the great projection of the trochanter major, the neck of the thigh-bone is exposed to every force which is applied to that prominence. It is further remarked, that fractures of the neck of the thigh-bone most frequently happen in persons of advanced age, in whose bones the proportion of gluten is always considerably less, than what it is at other periods of life. It is estimated, that, out of every ten fractures of this description, nine take place in subjects above the age of * sixty. When force is directed against the os femoris from before or behind the limb, a fracture of the neck of the bone is more likely to happen, than a dislocation, on account of the great

* "Fracture of the neck of the thigh-bone within the capsular ligament seldom happens but at an advanced period of life." A. Cooper, *Surgical Essays*, Part ii. p. 25.

depth of the acetabulum, and the firm manner in which the head of the bone is secured in the socket.

To the class of mechanical causes are to be referred, a forcible fall upon the great trochanter; a similar fall upon the knee, or alighting with great violence upon the feet: a powerful twist of the thigh-bone may also produce a fracture of its neck, in which case, as Brunninghausen * observes, the cause is ascribable to the obstacles in the way of a dislocation. Hagedorn, the author of a valuable treatise† on fractures of the neck of the thigh-bone, considers a fall sideways upon the great trochanter, as the most frequent cause of these accidents.

The following are regarded as some of the most infallible symptoms of a fracture of the neck of the thigh-bone: a remarkable diminution of the natural distance between the trochanter major and the crista of the ilium: when the surgeon takes hold of the bone near the knee with one of his hands, and applies the other to the great trochanter, which he is to move about, he finds the latter process extremely moveable, and during the movements a crepitus may sometimes be felt. The crepitus, however, will indicate a fracture of the neck of the bone, only when it is felt while the trochanter is moved about after extension of the limb. Should it be perceived before any extension had been practised, it would indeed denote a fracture, but not the situation of it.‡ The toes may be readily turned outwards or inwards, which is not the case in a dislocation; and, if the pelvis be fixed, the limb may be extended to the same length as the other; but, as soon as the extension is discontinued, the limb becomes shortened again. Amongst the surest signs of the accident, we are also to reckon with Langenbeck § the inclination of the knee and toes outwards; the motion of the great trochanter when the foot is moved; and if the foot be turned inwards, the inability of the patient to retain it in this position. Were the limb also shortened, the foregoing circumstance could not be imputed to a dislocation, in which case, the thigh-bone is almost immoveable in its unnatural position.

When the fracture is situated on the outside of the capsular ligament, a case not uncommon in younger persons, than those

* Ueber den Bruch des Schenkelbeinhalses überhaupt, und insbesondere über eine neue Methode denselben ohne Hinken zu heilen. Würzb. 1789.

† Marius Hagedorn, Abhandlung über den Bruch des Schenkelbeinhalses, nebst einer neuen Methode denselben leicht und sicher zu heilen. Leipzig, 1808.

‡ As a very little displacement separates the fragments, the surgeon will often be unable to distinguish a crepitus at all. According to Mr. A. Cooper, the rotation of the extended limb inwards most easily detects a crepitus.

§ Bibliothek für die Chirurgie, b. i. p. 777. 12mo. Götting. 1808.

who usually meet with other fractures of the neck of the os femoris, the displacement may be very extensive; but, in other instances, two circumstances tend to limit the separation of the fragments: first the capsule itself, the upper part of which retains that portion of the neck which adjoins the great trochanter, particularly, when the fracture is near the head of the bone; secondly, the fibrous expansion, which forms the immediate covering of the neck of the bone, and appears to be derived from the capsular ligament itself. This expansion is said to be seldom altogether lacerated *, and its preservation is regarded by some modern surgeons, perhaps too eager in their hope of an efficient bony union, as a circumstance of considerable importance in the cure.

The neck of the thigh-bone most frequently gives way at its middle; and seldom in old subjects towards the great trochanter. The injury may also take place so close to the head of the bone, that the small internal fragment consists entirely of the articular ball. Sometimes the fragments have been found to have very curious inequalities, by means of which they continued, as it were, to be locked and entangled so firmly together, that no displacement could happen, and even the weight of the body could be borne for several days. † According to the same writer, experience proves, that some fractures of the neck of the thigh-bone would be as much disposed to unite as any other cases ‡, were it not for the difficulty of

* I cannot understand, however, how this slender membrane escapes being entirely torn, when we find the shortening of the limb, and a consequent separation of the pieces of bone, invariable effects of the accident.

† Delpêch, *Précis des Maladies Chir.* t. i. p. 274.

‡ I am inclined to think with Mr. C. Bell, however, that "there is something unfavourable in the circumstance of the neck of the bone being surrounded by the secreting and lubricating capsule of the joint, and not by the cellular membrane and vascular muscles, which embrace the broken ends of the bone in other fractures. The broken head and neck of the thigh-bone must be deprived of that due degree of inflammatory action of the surrounding parts, which is necessary to sustain and consolidate it." *Operative Surgery*, vol. ii. p. 197. In all the examinations, which Mr. A. Cooper has made of transverse fractures of the neck of the bone, entirely within the capsular ligament, he has never met with a bony union, or of any which did not admit of motion of one bone upon the other. (See *Surgical Essays*, Part ii. p. 29.) However, a case of fracture of the neck of the thigh-bone, where a bony re-union had taken place within the capsular ligament, has just been published by Mr. Liston, of Edinburgh. The preparation is now in the Museum of the College of Surgeons in London. (See *Edinb. Med. and Surgical Journal*, No. 63, April, 1820, p. 212. &c.) This fact is of importance, because the possibility of bony union within the capsular ligament can no longer be doubtful, difficult as it may be to accomplish; and the propriety of employing the best apparatus for keeping the limb steadily in an eligible posture, cannot be questioned.

keeping the fragments in contact; that some admit of union through a process carried on only by one of the fragments, the uniting medium being a fibrous substance; while in other instances, no union whatever is effected.

It is evident, that the difficulty of keeping the surfaces of a fracture of the neck of the thigh-bone duly in contact, is perhaps greater, than in any other case which can be specified. It is quite impossible, as Delpech remarks, to surround the broken part with any apparatus capable of acting upon every point of the circumference of the fragments. The natural length of the limb may indeed be easily restored for a short time; but, in order to maintain it, it is necessary to contend incessantly against a vast number of muscles. The surgeon never has any positive criterion of the surfaces of the fracture being regularly and properly applied to each other.* In the horizontal posture, which is mostly preferred in these cases, it is difficult, Delpech asserts it is impossible, to hinder the limb from being rotated outwards†, and a proportionate change taking place in the relation of the fragments. Even were every indication fulfilled, it is argued, that still the least movement of the patient during the treatment would produce displacement, and that it is physically impossible for the patient to observe the requisite degree of quietude.‡ Hence, says Delpech, the reason why a cure without deformity is never accomplished; but, after the union of the fragments, the limb is always shortened, and the thigh turned outwards. Hence, in the most fortunate examples, the fragments only touch each other by a limited portion of their respective surfaces; a circumstance, which even when the fracture is on the outside of the capsule, and the two portions of bone retain an equal degree of vitality, renders the union of limited extent, and the consolidation tardy. Should the patient attempt to walk, before the uniting medium is completely ossified, a process for which the requisite time is quite various and indeterminate, a subsequent deformity must take place, or that which already exists, be increased.

* See also A. Cooper's Surgical Essays, Part ii. p. 50, 51. According to this gentleman, another impediment to the fragments remaining in contact, even where the length of the limb is preserved, arises from the secretion of a quantity of fluid into the unlacerated capsular ligament, which fluid distends the capsule, and continues to separate the fragments until all tendency to ossific union is past.

† By means of Hagedorn's apparatus, which will be presently described, this effect may be securely prevented.

‡ The ill effect of the occasional movements of the patient can only be hindered by employing an apparatus, which keeps up constant extension of the limb, and makes the distance between the pelvis and sole of the foot unchangeable when the patient moves about.

The fibrous expansion, which invests the neck of the femur, serves the office of the periosteum, and is the principal means through which the smaller fragment is supplied with blood. When it is torn, the latter portion of the bone is scarcely capable of contributing at all to the process of union, and the surface of the other fragment at length throws out irregular masses of a soft fleshy substance, in the midst of which the inner fragment remains, more or less moveable, without any other kind of connection to the rest of the bone. In this state, the movements of the joint must be considerably obstructed.

Sometimes, the frequent disturbance of the fracture does not impede union, but prevents the formation of callus; in which circumstance, a fibrous substance becomes the uniting medium, the subsequent lameness is great, and the limb is shortened, whenever it sustains the weight of the body.

Lastly, it often happens in old subjects, that the friction of the pieces of bone against each other causes them to be worn away, or absorbed, the neck of the bone entirely disappearing. Indeed, it would appear from the observations of a very distinguished surgeon, that the neck of the thigh-bone in old subjects sometimes naturally undergoes an interstitial absorption, by which it becomes shortened, altered in its angle with the shaft of the bone, and so changed in its form as, upon a superficial view, to give an idea of its having been the subject of fracture.*

Many of the French surgeons deem it a matter of impossibility to unite a fracture of the neck of the thigh-bone, with the two fragments accurately adapted to each other, and they offer a reward of two thousand francs to any body, who will produce two thigh-bones taken from the same subject, one of which has had a fracture of its neck cured without the least deformity.†

Respecting the indications in the management of such cases, however, modern surgeons entertain no differences of opinion. The objects are to restore the proper length of the limb; to resist its tendency to be twisted outwards; and to maintain things in this state long enough to afford every chance of the union of the fragments.

I think it is now universally admitted by surgeons, that, in fractures of the neck of the thigh-bone, the half-bent position of the limb, with the patient resting upon his side, ought for several reasons to be abandoned. When this mode of treatment is adopted, the posture soon alters, no efficient apparatus can be employed, the length of the injured limb cannot be compared with that of the uninjured one, and severe pain and

* A. Cooper, *Surgical Essays*, Part ii. p. 26.

† Delpech, *Précis des Maladies Chir.* t. i. p. 280.

other bad effects are the result of the continual pressure on the great trochanter.

With respect to the modification of the bent position, by letting the under part of the thigh, the calf, and the heel rest upon two boards, which gradually rise from the surface of the bed to an angle in the ham, while the patient lies upon his back, as already mentioned, I think it a much better plan, than that recommended by Mr. Pott. At the same time, I consider it imperfect, because, as far as I can judge from the description, it cannot make adequate extension, and it does afford proper support and steadiness to the foot.

All the reflections which I have been able to give this subject, convince me, that fractures of the neck of the thigh-bone can be most advantageously treated in the extended posture, the patient lying upon his back; for, the benefit of being able in this state to employ an efficient apparatus for keeping the limb duly extended, and the foot and knee in an eligible position, is far superior to that of a partial relaxation of the muscles.

As I have given an account in the Dictionary, of Desault's method of treating fractured thighs, I shall not repeat the description in the present volume. Boyer's plan, however, has been inadvertently left unnoticed; and, since it is generally allowed to be better than Desault's, I gladly avail myself of the present opportunity to give a brief explanation of it.

The principal parts of Boyer's apparatus are, a splint of particular construction, a foot-support, and a kind of padded belt, which is buckled round the upper part of the thigh.

The splint should be four feet long, and three finger-breadths wide. A groove, half an inch broad, and the extremity of which is covered with iron, runs along about half the length of the splint. To this groove a screw is adapted, which occupies its whole length, one end of it being supported against the plate of iron covering the extremity of the groove, and the other made to fit a key, by means of which it is to be turned. On the inside of the splint, a contrivance for holding up the foot-support is fastened to this screw. The upper part of the splint is received in a pocket situated on the external side of the circular thigh-belt. The sole, or foot-support, is made of iron, and covered with soft leather. It is connected by means of a mechanical contrivance to the above-mentioned screw. To that part of it which is near the heel, a broad piece of soft leather is attached, which, being split into two straps, serves for fixing the sole to the foot.

The thigh-belt is composed of strong leather, covered with the same material of a softer quality, and well stuffed with wool. Near the place where its two ends are buckled

together on the limb, the little leather pocket is sewed for the reception of the upper end of the long external splint.

The apparatus is applied as follows: after having surrounded the upper part of the thigh with a soft cotton band, the padded leather thigh-belt is put over it. The foot and lower part of the leg are then to be protected with tow, soft cushions, or any other soft materials, from the effects of pressure, and the sole is to be applied to the foot. The upper end of the splint is now to be fixed in the pocket of the thigh-belt, and the sole is fastened at the proper place to the screw-part of this long external splint. Pads, tow, or other soft materials, are next to be employed, wherever needed for preventing the ill-effects of the pressure of the foregoing apparatus, and also of two other splints, which will be required. One of these is laid all along the front or upper surface of the limb, the other is applied to the inner side of it; and both are secured in the ordinary manner.

Things being thus arranged, the screw in the groove is turned by the key, and the sole descends and brings the foot with it, while the superior part of the splint is pushed upwards. Thus, the limb may be gradually extended, and the extension, if necessary, increased.*

Perhaps, the most simple and effectual apparatus ever invented for fractures of the neck of the thigh-bone, is that suggested by Hagedorn. His opinion is, that every apparatus for these cases should be calculated to fulfil the following indications. 1st. It should keep the leg duly extended, and at the same time prevent the foot from being turned outwards. 2. As all pressure on the muscles of the thigh has a tendency to make them contract, the extension is more effectual, when applied, not to the thigh, but to the lower part of

* See *Traité des Maladies Chirurgicales et des Opérations qui leur conviennent* par M. le Baron Boyer, t. iii. p. 299., &c. 8vo. Paris, 1814.

The nature of Boyer's ingenious apparatus will be better understood by reference to plate 18. fig. 1.

- a. a. a. The limb extended.
- b. b. b. The splint for making continued extension.
- c. c. c. The screw for lengthening the splint.
- d. d. d. The key, or handle for turning the screw.
- e. e. e. The moveable worm, or female-screw, through which the long screw passes. It is furnished with plates, and calculated to slide upon the splint.
- f. f. f. The upper end of the splint received in the little pocket on the outside of the thigh-belt.
- g. g. g. The thigh-belt applied.
- h. h. h. h. The upper, or front splint, applied.
- i. i. i. i. i. Pads filled with wheat-chaff, or other soft materials.
- k. k. k. k. k. Tapes with which the whole apparatus is fastened.
- l. l. l. l. The iron sole.
- m. m. m. m. The supports of the iron sole.

Fig. 1.

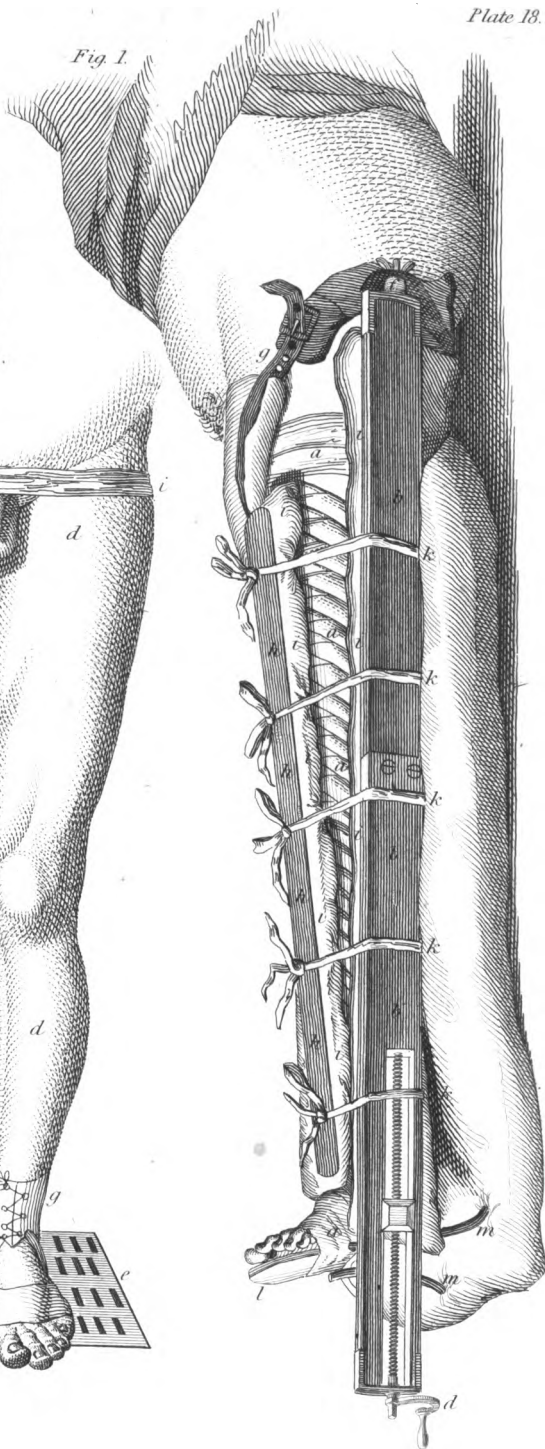


Fig. 3.

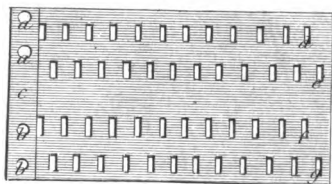


Fig. 2.

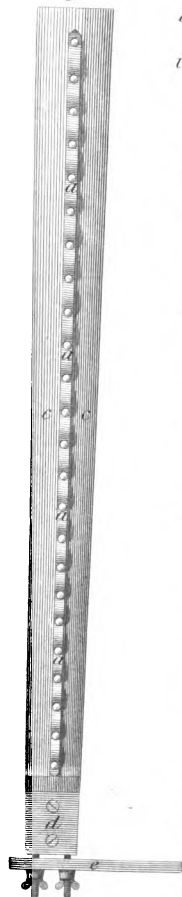
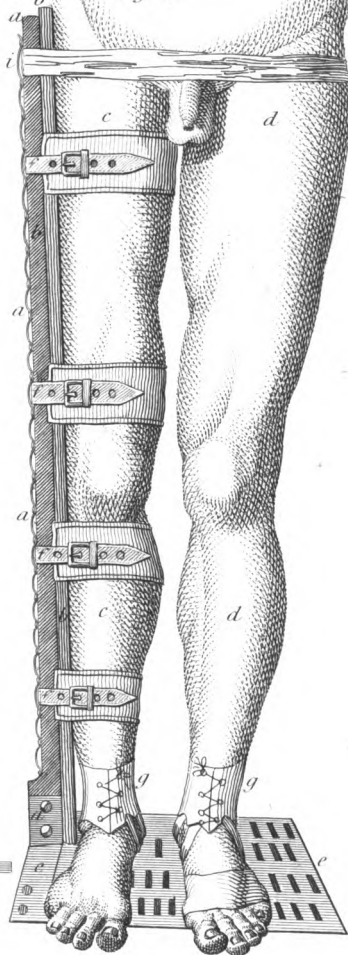


Fig. 4.



the limb. 3. The apparatus must be made as little irksome to the patient as possible. 4. The patient should not have it in his power to interfere with the extension and reduction. 5. The apparatus should admit of the employment of fomentations or other applications.

I believe a reference to plate 18. figs. 2, 3, and 4. will convey an adequate idea of Hagedorn's original and ingenious apparatus for the treatment of a fracture of the neck of the thigh-bone. The invention appears to me both more simple and more likely to answer every purpose, with less risk of failure, and less inconvenience to the patient, than either the contrivance of Boyer, or that of Desault.

See plate 18, fig. 2. A view of the outside of Hagedorn's splint, which for an adult is between three and four feet long, about five inches broad at its upper end, and becomes gradually narrower down to its lower extremity, where it is not much more than two inches wide. On its inside it is excavated from its highest part down to a little below the calf, where the concavity ceases, by which means the inferior part of it is stronger, and more fit for bearing the screws, foot-board, &c.

a. a. a. a. The slack leather, with the nails attaching it to the outside of the splint.

c. c. The middle of the splint, from which point it becomes smaller and smaller down to its lower termination *d*.

d. The lower end, to which the foot-board *e e* is firmly fixed.

Fig. 3. The foot-board.

a. a. Two holes, through which the foot-board is screwed to the splint when the case is a fracture of the neck of the left thigh-bone.

b. b. Two similar holes, when the fracture is on the right side.

c. c. The edge of the foot-board made thicker, the breadth an inch, or an inch and a half, and strengthened with a plate of iron, in order to make it capable of firmly holding the screws, which fasten it to the lower end of the splint.

d. e. f. g. Four rows of slits, or holes, through which the ends of the bandage pass, which fasten the foot to the foot-board.

Fig. 4. Represents the whole apparatus, as employed in the treatment of a fracture of the neck of the left thigh-bone.

a. a. a. a. The splint applied to the uninjured limb.

b. b. b. A long pad placed between the splint and the outside of the limb.

c. c. The sound limb.

d. d. The left limb, in which the neck of the thigh-bone is fractured.

e. e. The foot-board.

f. f. f. f. Four leather bands, with straps and buckles for securing the splint and long pad upon the sound limb.

g. g. The leather contrivances, somewhat like gaiters, designed to connect the feet securely with the foot-board. Each of these leather bandages has four straps, two of which are conveyed on each side of the foot through two of the holes in the foot-board, and fastened underneath it. The leather, of which these pieces of the apparatus are made, should be rather stiff, and well quilted within, or lined with very soft materials. In front, each of these foot or ankle-pieces admits of being laced, so as accurately to fit the part.

h. The broad linen band, which keeps the foot inclined inwards. Between this band and the instep, some soft materials, or a pad, should be placed. It has four tails, two of which on each side pass through the anterior rows of holes in the foot-board, and are tied underneath it.

i. i. A soft linen band, the use of which is to fasten the splint to the pelvis.

k. An empty space, which is sometimes filled up with a small pad.

Lastly, it is to be understood, that between the soles of the feet and the upper surface of the foot-board, soft pads are placed, which being of the same shape and size as the soles of the feet, do not appear in this engraving.

Hagedorn gives the following directions respecting the mode of putting on the above apparatus. Previously to the reduction, the splint is to be fastened upon the sound limb, and the two ankle-leathers applied. After the reduction, two assistants are to keep the limb extended, while the surgeon screws on the foot-board, and places under the sole of the sound limb the pad, or little cushion, which becomes secured in this situation as soon as the four tails of the ankle-leather have been drawn through the first and second rows of slits in the foot-board, and tied underneath it in a couple of surgeon's knots. The sound limb is now to be approximated to the broken one; both are to be put in the most natural situation and position; the other cushion is to be interposed betwixt the foot-board, and the sole of the fractured limb; the four tails of the ankle-leather on the injured member are to be drawn through the first and second rows of slits in the foot-board and tied; the foot-board itself is now to be screwed to the splint as firmly as possible, and a little wedge, not mentioned in the previous account, pushed into the space between the two screws and the foot-board. Lastly, in order to prevent the toes from being turned outwards, the band is applied across the upper part of the foot, and its tails fastened under the foot-board.

Nothing can be more simple, and better qualified than this apparatus, for maintaining the extension, and holding the foot

in any position which may be deemed best, and this, without hurting any part by the pressure employed, or causing any kind of serious annoyance to the patient.

As soon as Hagedorn's simple but efficient apparatus is at all known in England, I have no doubt that it will here be considered by every impartial judge as the very best contrivance, not only for the treatment of fractures of the neck of the femur, but also for that of all oblique and very troublesome fractures of the same bone, especially, as in these cases, it would not preclude the application of splints to the injured thigh itself.

FRACTURES OF THE PATELLA.

These are almost always transverse; seldom oblique; and still more rarely longitudinal, or perpendicular. The bone, however, is sometimes broken into three or four pieces.

A longitudinal fracture, and that in which the patella is split into several pieces, are invariably owing to external violence, like a fall, or a blow, and are attended with a good deal of contusion, and sometimes with a wound, or an extravasation of blood within the knee-joint. A transverse fracture is also now and then produced in the same way; but the usual cause is a violent contraction of the extensor muscles of the leg. In order that the fracture may happen, it is by no means necessary for the power of those muscles to be increased by their being affected with spasmodic action, since experience proves, that their natural contraction is adequate to produce the effect, when the body is inclined backwards, and the patient is in danger of falling upon his occiput. In this dilemma, the knee being bent, the extensor muscles of the leg act with considerable force to assist in bringing the body forwards again, and hinder it from falling backwards; while the patella, the posterior surface of which at this moment only rests upon a point of the forepart of the condyles of the femur, is placed between the resistance of the ligament connecting it to the tibia, and the action of the extensor muscles. Under these circumstances, if the action be superior to the resistance, the bone snaps; an event now more likely to happen, because in consequence of the flexion of the knee, the direction of the extensor muscles and that of the ligament of the patella, are rendered oblique with respect to the vertical axis of this bone. Hence, these two powers, one of which acts upon the upper, and the other upon the lower, portion of the patella, have the effect of tending to bend it backwards

exactly at that point which rests upon the condyles of the thigh-bone. *

Though such is the principle, on which the generality of transverse fractures of the patella are produced, a few cases upon record establish the possibility of the bone being also broken by the violent action of the muscles, while the leg is perfectly straight, and, of course, the force applied precisely in the axis of the bone. Thus, the fracture has been known to take place during an attack of convulsions, while the patient was lying stretched out upon his back; but, it is probable, that whenever the patella is broken in this way, the muscles must act with immense force.

Whether the ligamentous expansion covering the anterior surface of the patella be lacerated, or not, is a circumstance which makes an important difference in simple fractures of this bone. In general, when the knee has not been considerably bent in the fall, or in the improper examinations of the limb, the above ligamentous layer is left partly, or entirely unlacerated; and the fragments of the bone are then only moderately separated from one another. But, when the knee has been violently and repeatedly bent, the ligamentous covering of the front of the patella is more or less torn, and the pieces of bone drawn further asunder.

The history of surgery does not furnish numerous instances of the longitudinal fracture of the patella: one such case, however, is related by Lamotte.

There is no difficulty in ascertaining the existence of a transverse fracture of the patella. When the patient is standing up at the period when the force of the muscles breaks the bone, the subsequent fall is a consequence of the accident. In this case, as well as in the example in which the bone is broken by the fall itself, the patient cannot get up without succour; and if, when he is put upon his legs, he endeavour to walk a few paces forwards, he falls down again. But, if he be assisted with an arm, and keep his limb straight, he may hobble along a good way, drawing the member after him, and meet with no other fall, especially, if the ground be not too irregular. The transverse division of the bone, and the interspace between the two fragments, can be plainly distinguished under the integuments. Instead of the prominence of the patella in front of the knee, a flatness or even a depression may be remarked. When the leg is extended and the thigh

* Boyer, *Traité des Maladies Chirurgicales*, tom. iii. p. 322, 323. 8vo. Paris, 1814.

bent; the two pieces of bone are brought near together again, and a very little pressure will then suffice for putting them in contact with each other. When this has been done, if they be moved laterally in opposite directions, they will rub against each other, and a crepitus be felt. However, it is only when the soft parts are not considerably swelled, that the solution of continuity in the bone, and the separation of the fragments can be distinguished, in which circumstance, the surgeon would have to form an opinion upon the nature of the injury from other circumstances above explained; and these might not remove all uncertainty upon the subject. But, his inability to dispel every doubt is here not a matter of any importance, as the unquestionable indications are to adopt measures for the diminution of the inflammation and swelling of the soft parts, and to keep the limb in the straight position, without attempting at first to cover the injured part with any thing which will irritate or compress it.

Fractures of the patella are very rarely united by bone, the connecting medium being in almost all cases a fibrous ligamentous substance.* This fact is chiefly to be ascribed to the very great difficulty of maintaining the surfaces of the fracture in complete contact, and, perhaps, in some measure, to the ligamentous, or tendinous structure of the adjacent and intervening parts. The possibility of a bony union, however, is universally admitted; and Professor Lallemant is † alleged to have in his possession a patella, which exemplifies the fact.

But, though experience hold out little hope of these fractures being accurately united by bone, the same source of knowledge leaves no doubt of one important fact relating to this point, viz. that, when the union is effected by means of a ligamentous substance, the perfect action of the extensor muscles, and, of course, the exemption from future infirmity

* "Patella fracta, haud uti alia corporis humani ossa vero callo concrescit, sed fragmenta solum mediante substantiâ firmiore, cellulosa, cartilaginosa, cum ligamento mucoso concurrente conglutinantur, et firmiori cicatrizatione ligamentorum continentur, quod constans experientia in vivis et cadaveribus nos edocuit." Callisen Syst. Chir. Hodiernæ, § 1288. Respecting one part of this statement, however, it is at variance with the observations of Boyer, who says "L'interposition du paquet graisseux placé derrière le ligament inférieur de la rotule, et que l'on a cru pouvoir remonter et se placer entre les fragmens, est une de ces idées hasardées que l'observation et l'anatomie démentent également." *Traité des Maladies Chir.* t. iii. p. 331.

† Richerand, *Nosographie Chirurgicale*, t. ii. p. 387. ed. 4. The case is detailed by Boyer, in his *Traité des Maladies Chir.* t. iii. p. 354.

of the knee, will mainly depend upon the shortness of the connecting medium, and the little distance between the two fragments.

In the treatment of a common transverse fracture of the patella, the indications are:

1st, To place the limb in such a position, as will relax the extensor muscles of the leg as much as possible.

2dly, To maintain the limb in this position by means, which will counteract the efforts of the flexor muscles.

3dly, To keep the fragments pressed towards each other, so that they may be, if not in actual contact, at least not far apart.

Previously to the time of Desault, surgeons were in the habit of placing a splint behind the knee, or two instruments of the same kind at the sides of this joint, in order to keep the leg extended; but, in the latter situation, they could not effectually answer the purpose, and, when one was used behind the limb, it was generally much too short. It was Desault who first explained the utility of employing a splint, which extended nearly all along the back part of the thigh and leg. Between such a splint and the flesh a suitable pad must always be put, in order to hinder the bad effects, which might otherwise arise from the pressure of the hard materials of the splint upon the limb. A long splint, and corresponding well-stuffed pad, are then to be considered as necessary parts of the apparatus for the treatment of a broken patella.

The only other requisite articles are two small compresses, a common roller, and three or four pillows.

I will suppose, that the surgeon has just arrived at the patient's bed-side, and ascertained the nature of the accident. The first thing to be done, is to put the patient in such a posture as will relax the extensor muscles of the leg, and allow the pieces of the patella to be placed near together. With this view, the patient is to lie with his trunk and head somewhat elevated, by which means, the anterior inferior spinous process of the ilium, from which the rectus muscle arises, will be inclined forwards towards the thigh. Then an assistant is to take hold of the foot, and raise the limb from the bed, being very careful to keep the knee from bending; and when the thigh and leg have been thus elevated to such an angle, as will perfectly relax the muscles attached to the patella, the surgeon is to form with the pillows above mentioned a surface for the support of the limb, gradually rising from the buttock to the heel.

The fragments of bone are now to be pressed towards each other; and an endeavour made to keep them so approximated

by means of the two compresses, one of which is to be secured with a few turns of the roller just above the upper fragment; and the other, immediately below the lower one. While these things are doing, the assistants are steadily to hold the limb up, without allowing the knee to be at all bent.

Lastly, the long splint and its cushion having been laid under the thigh and leg, and secured with the rest of the roller, the limb and apparatus are to rest upon the inclined surface formed by the pillows in the manner already specified.

When the knee is considerably swelled, the surgeon must defer for a few days the application of the splint, compresses, and bandage, as the first indication in this circumstance is to take proper measures for diminishing the inflammation of the joint. Here, however, the observance of the position above recommended, and now and then gently pressing together the fragments of the bone, will have the most beneficial consequences.

For the cure of fractures of the patella, Baron Boyer employs a very simple, but effectual apparatus, which fulfils every indication, with less risk of failure, than the common means. It consists of a hollow wooden splint, long enough to reach from the middle of the thigh to below the calf, sufficiently deep to embrace two-thirds of the thickness of the limb; broader above, than below; and lined with wool, or other soft materials. On the outside of the edges of this splint, little round-headed pegs, or nails, are arranged, the use of which is for fixing the straps, which serve for holding the fragments of the bone in a state of approximation. These straps are two in number, rather more than an inch wide, and about seven inches long. Their middle portions are quilted with wool, covered with chamois, and made of softer leather than their extremities, which are of calf-leather, and furnished with holes placed at the distance of about a quarter of an inch from each other. The limb is to be placed in the concavity of the splint, the ham occupying its middle; and the empty spaces, left between the limb and the apparatus, are to be nicely filled up with soft tow. Then, while an assistant presses the pieces of bone together, the straps are to be applied in such a way, that the one which lies above the upper fragment of bone, is to be fastened to two of the pegs lower down; and that which crosses immediately under the lower fragment is to be fastened to two pegs situated higher up. By this contrivance, the straps, the ends of which cross each other, leave between them a transverse elliptical space, in which is comprehended the broken patella. Any resolvent lotion may now be applied to the injured part; and, lastly, the limb is secured in the splint

by means of a roller, or four or five pieces of broad tape, doubled, and tied over one side of the wood.

One of the principal advantages of the foregoing apparatus, is its leaving the parts about the broken bone completely in view, so that the surgeon is always able to judge of their condition. It also effectually compresses the pieces of bone towards each other, without creating any risk of mortification. It does not so readily become slack, as a cloth bandage; and, when requisite, it can be tightened in a moment, without in the least disturbing the limb. Boyer candidly tells us, however, that, at first, most of his patients complained of the leather straps hurting them; but, he adds, that the uneasiness either soon ceased of itself, or was obviated by making the leathers a little slacker.* On an average, the connecting medium of fractures of the patella requires about two months to gain such strength, as will ensure it from yielding and becoming elongated. In old subjects, indeed, ten days longer should be allowed for the completion of the uniting process.

Many surgical writers recommend the knee to be moved a little every day at an early period of the treatment, in order to prevent the joint from becoming stiff. But, premature flexion of the knee will have the effect of elongating the uniting substance of the two fragments of bone, and increasing the distance between them; the sure consequence of which will be a permanent weakness of the knee, much more serious, than the curable rigidity proceeding from confinement of the joint. For this reason, Boyer generally enjoins his patients not to begin to bend their knees earlier, than two months after the accident.†

When the case has been badly treated, or neglected, and the upper piece of the broken patella continues permanently retracted far up the thigh, with a long ligamentous substance forming the connection between the two fragments, experience proves, that the extensor muscles of the leg may gradually regain a good deal of the power which they lose under these circumstances. As an illustration of this fact, Mr. Abernethy mentions in his lectures the advice given by Mr. Hunter to a patient in this condition: it was that he should sit upon a table, and frequently try to put the extensor muscles of the leg in action, while the limb was swinging backwards and forwards. By persevering in this way for some time, the patient at length found that he had some power of extending

* *Traité des Maladies Chir.* t. iii. p. 346. † *Ibid.* t. iii. p. 348.

the leg. A weight was now put on the foot, and by degrees increased in proportion as the above muscles recovered their power, which in the end was in a great measure accomplished.

Mr. C. Bell mentions a serious accident, which befell a man, whose patella had been united by a ligamentous substance, which was adherent to the skin. The poor man, as he was carrying a burden, fell backwards, his knee sunk under him, and the whole front of the joint was lacerated and laid open. The case terminated in amputation. *

FRACTURES OF THE LEG.

As Boyer has remarked, one might on a cursory examination be struck with the analogy of structure between the leg and the forearm. Two bones parallel to each other; articulated together at their two ends; separated throughout the remainder of their length by a space, which is occupied by a ligamentous membrane; connected above with the thigh by an angular ginglymoid articulation, and below with the foot by the same species of joint; and their surfaces and the interosseous ligament affording attachment to numerous muscles, destined to move the foot and toes: such are the points of resemblance. But, the two bones of the leg have no movement upon each other, answering to the pronation and supination of the radius; and it is only one of them viz. the tibia, that is articulated with the femur, and transmits the weight of the body to the ankle-joint, of which it forms the only central part; while the other, the fibula, which for the upper thirds of its length appears only to serve the purpose of increasing the surface of origin for the muscles, reaches down on the outside of the ankle-joint, even lower than the level of the malleolus internus, and below seems merely intended for preventing the foot from being turned too much outwards. These peculiarities make such difference in the causes, mechanism, symptoms, and treatment of fractures of the leg, that they are accidents which do not admit of comparison with those of the forearm. †

The cases, in which both bones of the leg are broken together, are more frequent than those, in which only one of them is fractured. When the two bones are broken, the solutions of continuity are sometimes parallel; sometimes at

* C. Bell, *Operative Surgery*, vol. ii. p. 204.

† Boyer, *Traité des Maladies Chir.* t. iii. p. 359.

different heights. The direction of the fracture of each bone is also subject to variety, in some cases being transverse, which is most common in children; in other instances, being oblique; and, what is remarkable, the obliquity of fractures of the tibia has something determinate about it, usually extending from below upwards, and from within outwards, so that the end of the upper fragment is generally manifest below the integuments at the front and internal part of the leg. Lastly, either of the bones may be broken in several places, and the soft parts more or less contused, or lacerated, either by the ends of the broken bone, or the same force which occasioned the fracture itself.*

Cases, in which the two bones are broken, are frequently the consequence of falls upon the feet, and then the fracture is mostly oblique, and that of the tibia happens a little below its middle portion. However, when the tibia gives way at this point, it often happens, that the fibula breaks towards one of its extremities. As the tibia alone sustains the weight of the body, it is evident, that when both bones are broken by a force, which acts perpendicularly, the tibia gives way first, its fragments are displaced, and the force continuing to operate, then bends the fibula, the fracture of which is subsequent to that of the other bone. Both bones of the leg may also be fractured by violence applied directly to the seat of the injury, as when the wheel of a carriage passes over the limb, while this is extended on the ground, or a heavy body falls upon the member.

In fractures of the leg, the displacement of the fragments depends upon the direction of the division of the bones, and the nature of the cause of the injury. When the fracture is transverse, the displacement can only take place in the diameter of the fragments, particularly when the injury is situated high up, where the surfaces of the broken part of the tibia, which are applied together, are large. In fractures of both bones of the leg, however, it is remarked, that the ends of the bone seldom remain long in their natural situation, even when their surfaces are broad, and the solution of continuity is transverse, because every movement of the limb has a tendency to produce displacement. When the fracture is oblique, and has been produced by a fall on the foot, the ends of the fracture must inevitably pass beyond each other. In the majority of instances, the end of the upper piece of bone presents under the integuments of the shin a sharpish point

* Boyer, *Traité des Maladies Chir.* t. iii. p. 361.

directed downwards and inwards; while the extremity of the lower portion is drawn backwards and outwards by the muscles of the calf. However, notwithstanding the obliquity of the surfaces of the fracture, and the tendency to displacement necessarily resulting from it, experience proves, that these cases are never followed, as broken thighs are, by any subsequent increased shortening of the member, excepting where the tibia has been driven out through the skin; and Boyer, I believe, very correctly imputes the fact to the greater number of the muscles being attached to nearly the whole length of the tibia and fibula.* Where the former of these bones protrudes far through the integuments, of course the attachments of the muscles, and probably also those of the interosseous ligament, are extensively torn; a circumstance accounting for the disposition of the limb then to be shortened.

The lower portions of the broken bones are also liable to a rotatory displacement; an inconvenience facilitated by the foot being naturally turned outwards, and the greater portion of its mass and weight being external to the axis of the limb.

Fractures of both bones of the leg are readily ascertained; for the slightest deformity is obvious along the sharp ridge termed the spine of the tibia, as well as upon its anterior flat surface, usually called the shin. The gentlest movement of the member will also produce a very plain crepitus.

To the directions given in the Dictionary, for the reduction and treatment of ordinary fractures of the tibia and fibula, I have nothing particular to add in the present place; but, there is one case, which I am called upon to notice, because it is an example, on the treatment of which Mr. Pott and Dupuytren offer different sentiments. Having given in the article *Dislocation* of the foregoing publication, the opinions of the first of these eminent surgeons on the utility of the bent position, and of the relaxation of the strong muscles of the leg, in the management of fractures of the fibula, accompanied with luxation of the ankle, I shall not here recapitulate his arguments; but confine myself to a plain statement of the recent observations of Dupuytren, the value of whose sentiments can only be determined by fair and comparative trials of the two modes of practice recommended.

The plan of treating fractures of the fibula, with luxation of the foot in general use in England, is that of Pott; but, notwithstanding the greatest care and attention, it is alleged,

* Vol. cit. p. 364.

that some degree of distortion of the foot, or confinement of its movements from a little displacement of the fractured portions of the fibula, has been a frequent consequence of this accident so managed. It is said, that Pott's method of treatment does not appear calculated to prevent the falling-in of the lower extremity of the fibula towards the tibia. In a fracture of the lower end of the fibula, when the foot is brought into the state of extreme adduction, it draws by means of the lateral ligaments the point of the outer malleolus in an inward direction, and, consequently, the fractured portion corresponding to it is drawn outwards from the tibia. It is on this principle, that M. Dupuytren's mode of treating this accident is founded. In all cases, then, a fracture of the fibula, accompanied with luxation of the astragalus inwards, (that is with distortion of the foot outwards,) requires an apparatus, which maintains the foot turned inwards, and the inferior fragment of the fibula raised from the tibia, and in the direction of the superior fragment. The simple apparatus recommended by Dupuytren is as follows: a cushion, a splint, and two bandages are the whole of it. The cushion, made of linen, and stuffed two-thirds full of hair-balls, or chaff enclosed in bags in the usual manner, should be two feet and a half in length, four or five inches in breadth, and three or four inches in thickness. The splint is to be from twenty to twenty-three inches in length, and three inches broad. Lastly, the two rollers should each be from four to five yards in length. The cushion, doubled in the form of a wedge, should be applied on the internal side of the fractured limb, its base below, and resting on the internal malleolus, without passing beyond it; its summit above on the internal condyle of the tibia. The limb is thus protected from the splint, which derives from the pad a support, that keeps it at the distance of several inches from the internal margin of the foot, and at the same time tends to throw the tibia outward. The splint, applied along the cushion, should extend six or seven inches below it, which will be about four inches below the internal margin of the foot. These parts of the apparatus being thus disposed, should then be fixed by one of the bandages passed round the limb below the knee, when the portion of the splint extending below the cushion will leave between itself and the foot an interval of several inches, and furnish a *point d'appui* to which the foot may be drawn from without inwards. In order to effect this purpose, the second bandage should be drawn from this point over the instep and the heel, alternately embracing the splint and the parts of the limb just indicated, in circles gradually lessening, and forming the figure of the cypher 8 with

the crossing part on the splint. Thus, the apparatus acts on the principle of a lever of the *first kind*, in which the *point d'appui* is the base of the cushion, a little above the malleolus internus, and in which the resistance, as well as the power acting on the fracture, are in the extremities of the foot. The foot thus drawn must yield to the action of the lower bandage, while the tibia, pressed by the base of the cushion, must be propelled outwards with the astragalus. Lastly, it is evident, that as the lower fragment of the fibula is drawn downwards by the external lateral ligaments of the ankle, a tilting movement must be produced on the external surface of the astragalus, contrary to that which displaced it. With a view of obtaining a complete reduction, Dupuytren says, that the surgeon must not confine himself to drawing the foot in a perpendicular line under the limb; it must be brought as much inwards as it had been turned outwards by the peroneal muscles.

After the foot has been retained a good while in this forced state of adduction, if it should not return to its ordinary position, the defect may be easily remedied by applying the preceding apparatus to the outer surface of the leg and foot.

When, with a fracture of the fibula, the foot is drawn backwards and upwards, Dupuytren applies the splint and cushion to the back part of the leg down to the heel. One roller is applied below the knee; and a second round the lower end of the tibia and splint. A square pad should always be put between the lower bandage and the tibia. Of 207 cases of fracture of the fibula, comprising all the varieties of this accident treated in the above way, by Dupuytren, 202 were cured; the remaining five died, three of them from the consequences of the injury itself, or from complications independent of it.

Seven-tenths of them happened to the right leg; six-tenths arose from violent adductive motions of the foot; three-tenths from similar abductive movements; and one-tenth from blows, or the passage of some heavy body over the external and inferior part of the limb. With respect to the seat of the fracture of the fibula; in five-tenths, it was two inches from the lowermost point of the external malleolus; in three-tenths, below this point; and in two, above it. Those cases which happened within two inches of the external malleolus, were often complicated with displacement of the foot; the others but rarely. *

* See *Mémoire sur la Fracture de l'Extrémité inférieure du péroné, les luxations, et les accidens qui en sont la suite*, par M. Dupuytren, in *Annuaire Medico-Chirurgical des Hôpitaux de Paris*. 4to. Paris, 1819.

CHAPTER XLI.

PARTICULAR DISLOCATIONS.

DISLOCATION OF THE LOWER JAW.

EXPERIENCE proves, that persons of all ages are not equally liable to dislocations of the lower jaw. In children, the rami of this bone form, with its body, or rather the plane of its base, a very open angle, these parts being in reality almost in the same line. By reason of this conformation, the condyles are articulated with the base of the cranium at a very acute angle, the sinus of which is turned forwards. Hence, an obtuse angle with the base of the skull could never be produced, unless the lower jaw were depressed in a degree, which can never happen, and which neither the length of the elevator muscles, the natural mode of opening the mouth, nor even the situation of the vertebral column, will permit. In very young subjects, therefore, luxations of the jaw are never observed, notwithstanding children are commonly putting large substances into their mouths, and doing those things, which are well known to promote at other periods of life the occurrence of the accident; and, as far as my observations extend, Boyer's remark is correct, that it is unusual for the lower jaw to be dislocated before the dental arch is completed, and the bone has attained its final shape. *

The lower jaw is subject to only one species of dislocation, namely, that in which the condyles advance forwards over the eminentiæ articulares, and slip under the zygoma. Sometimes the luxation is confined to one side; but, in all common instances, both condyles are displaced. These two different cases ought unquestionably to have appropriate names—names, which will not convey any erroneous notion: therefore, instead of calling the displacement of both condyles a *complete dislocation of the jaw*, and that of one condyle, an *incomplete dislocation*, terms, which may lead to the supposition, that there are cases, in which the condyles do not entirely quit the articular surface of the temporal bone, I should think with Professor Boyer, that it is best to denominate the displacement of both condyles simply a *dislocation of*

* Boyer, *Traité des Maladies Chirurgicales*, tom. iv. p. 77, 78.

*the jaw, and the other instances, dislocations of the right, or left condyle.**

A very little consideration would inform a surgeon, duly acquainted with anatomy, that the condyles of the lower jaw could not be displaced backwards, under the prominence formed by the lower part of the meatus auditorius, unless the bone were raised considerably above its point of contact with the upper jaw. Nor could one condyle be displaced outwards, without the other being at the same time carried inwards, below the projection of the spinous process of the sphenoid bone. This is a movement, therefore, which may be regarded as impossible, because it could not take place without a fracture of the spinous process, and any blow, or cause at all calculated to produce this accident, would be much more likely to fracture the ramus, or body of the lower jaw-bone itself.

With respect to the causes of a dislocation of the jaw, every thing that has a tendency to separate the upper and lower maxillæ further from each other, than is natural, may occasion the accident. Thus, yawning, vomiting, laughing, and blows on the chin, may be considered as the most frequent causes of the displacement.

When the lower jaw is dislocated by the action of the muscles, as in gaping, vomiting, laughing, &c. the muscles, which are inserted into the os hyoides first depress the bone, and, in proportion as this movement increases, the pterygoideus externus acts, and draws the condyle and interarticular cartilage forwards upon the eminentia articularis. The displacement now more readily follows, because in the above-mentioned circumstances, the pterygoideus externus contracts in a powerful and spasmodic manner.†

According to Professor Boyer, the condyles of the lower jaw in cases of dislocation are removed but a trivial distance forwards beyond the transverse processes of the temporal bones. In this articulation, the capsule, the structure of which can hardly be called fibrous, being almost entirely cellular, is loose enough to admit of this slight displacement without being lacerated. At least, this is said to be the fact in the majority of instances. It is also alleged, that the external lateral ligament is not broken, because its upper insertion

* Boyer, vol. cit. p. 79.

† Sometimes the lower jaw has been luxated by violence used in extracting the teeth. See a case of this kind related by Loder, *Chirurgisch-Med. Beobachtungen*, p. 181, 8vo. Weimar, 1794.

being situated more forwards than its lower attachment, it is sufficiently long to permit the condyle to glide under the eminentia articularis, and when the first of these two parts is arrived in front of the other, the length of the ligament yet suffices, on account of the condyle rising a little upward. *

When the lower jaw is dislocated, the mouth is at first widely open, and the space between the two arches of the teeth is considerable; but, a short time afterwards, this distance is lessened, the two jaws come nearer together, and the edges of the incisores teeth remain about an inch and a half asunder. This change, which sometimes takes place immediately after the luxation, is to be ascribed to the action of the temporal muscle, which has the more effect because its insertion into the coronoid process is now nearly at a right angle, while no impediment to the movement in question presents itself. This movement, however, cannot be carried so far as to bring the teeth together, since its extent is restricted by the coronoid process actually touching the lower part of the cheek-bone, near the malar suture; an observation made many years back by Dr. A. Monro, senior. When the case is a dislocation of only one condyle, the approximation of the jaws carries the apex of the coronoid process towards, and generally into contact with, the base of the malar process of the upper maxillary bone; while the last upper grinder, on the injured side, rests against the lowest part of the inner side of the front edge of the coronoid process. Sometimes, the contact of parts, limiting the closure of the jaws, only happens at the last point, the coronoid process being too short to touch the prominence of the cheek-bone.

When the lower jaw is dislocated, the bone is depressed and fixed in this position, and, as already explained, the dental arches are separated by a space of about an inch and an half. The upper and lower teeth no longer correspond: the lower incisores are placed too much forwards; and it is at the same time manifest, that if the mouth were completely shut, these teeth would project beyond those above them. The grinders undergo an analogous displacement, each of the lower ones advancing some distance more forwards, than its fellow in the upper jaw. The space between the molares of the two jaws is not very great, and, in many cases, the thumb can scarcely be got between those situated furthest back. The irritation and compression of the parotid glands produce an increased secretion of the saliva, which is involuntarily

* Boyer, *Traité des Maladies Chir.* t. iv. p. 87.

discharged from the mouth, the lips not being sufficiently close to prevent its escape. The articulation of words is difficult, and the pronunciation of syllables with the labial consonants impossible. Instead of the prominence formed by the external side of the condyle, immediately in front of the meatus auditorius externus, behind the root of the zygoma, a depression may be remarked, caused by the outer portion of the glenoid cavity of the temporal bone. The elongation of the muscles occasions a flatness of the cheeks and temples; and the projection of the coronoid process is very distinguishable through the cheek, and especially within the mouth.

When the case is a dislocation of only one condyle, the chin inclines to the opposite side; the lower teeth undergo a corresponding displacement; the depression just in front of the ear, arising from the displacement of the condyle, is only on the injured side; and the articulation of words is defective, but not altogether impeded, the patient stammering as he attempts to speak. * In a fat subject, or in a case which has existed some time, I can well conceive with Mr. Hey†, that the lateral inclination of the chin may not be very obvious; but, in recent cases, and in persons who are not too fat, I should always expect to be able to notice such displacement, as it is a change which must mechanically and immediately follow the removal of one of the condyles from the glenoid cavity, while the other continues in its right situation.

What happens, if a dislocation of the lower jaw be left unreduced? At first, the bone remains fixed in its new situation; the saliva is involuntarily discharged from the mouth, its quantity being for some time very copious, but afterwards diminishing; mastication is totally impeded, but, when the head is drawn backwards, liquids can be swallowed. Examples are even mentioned, in which the unreduced dislocated jaw was rendered perfectly immoveable in consequence of ankylosis. However, this is far from being always the case; and *Monro* relates an instance, of such a dislocation, which had neither been detected, nor reduced, where, after a time, the patient recovered the power of elevating and depressing the jaw, without being able, however, to put the teeth completely together. Other examples are likewise recorded, in which the lower jaw was gradually raised enough to admit of the lips being easily brought together, and made capable of hindering the escape of the spittle. *Boyer* even thinks it probable, that, if it were not for the impediment, which the cheek-

* *Boyer*, vol. cit. p. 89.

† *Hey*, *Practical Observations in Surgery*, p. 325.

bone makes to the passage of the coronoid process under the zygoma, the jaw might by degrees become completely elevated, and, a new joint being formed between the condyles and the anterior portion of the transverse process of the temporal bone, the power of masticating might be perfectly re-established. Ravaton actually saw a young recruit, one of the condyles of whose lower jaw had been out of its place two years, yet the patient was able both to chew and speak, though with some difficulty.

Except when the accident has been caused by outward violence, and the soft parts are much injured, there are only two indications in the treatment of a dislocated jaw ; viz. to reduce the bone, and to keep it reduced.

In order to accomplish the first of these purposes, the patient is to be placed upon a low seat, and his head is to be supported against the breast of an assistant, who is to apply both his hands close round the forehead. The surgeon being in front of the patient, is to put his thumbs, covered with a handkerchief, or a thick pair of gloves, as far as he can betwixt the back grinders on both sides of the mouth. The fore-fingers are then to be applied to the crowns of the last lower grinders, while the body of the bone is grasped on each side with the rest of the fingers, which are to extend obliquely under its base. While the head is steadily held in the above way, the surgeon now presses directly downwards with his thumbs, by which means the condyles are separated a little way from the anterior part of the transverse process of the temporal bone. This movement is to be performed in an uniform manner, without either raising or depressing the chin. The condyles are then to be inclined backwards and a little downwards, by pressure applied to the back molares and the coronoid process, and at the same time, the chin is to be inclined with the fingers upwards and forwards.

As soon as the condyles slip into the glenoid cavities, the muscles generally act, and suddenly shut the mouth, so that, if the surgeon were not quickly to move his thumbs towards the cheeks from between the grinding teeth, they might be injured. Hence the prudence also of protecting them with a napkin, handkerchief, or, what is better, a thick pair of gloves. It must be acknowledged, however, that the danger here spoken of has been rather exaggerated by writers on surgery, as upon the reduction taking place, the muscles do not shut the mouth with the force generally represented. *

* Boyer, *Traité des Maladies Chir.* t. iv. p. 93.

According to that excellent practical surgeon, the late Mr. Hey, if both sides of the jaw are pressed upon, while one side only is dislocated, the reduction is rather prevented. Therefore, before any attempt is made, he considers it the best method to examine carefully, whether both the condyles are dislocated, and in case one only should be out of its place, to apply force merely on the side where the displacement exists. At the same time, he is inclined to think, that, even when both condyles are out of their places, the application of pressure to one side of the jaw will not be injurious, as he has often succeeded in reducing one condyle first, and then the other, though he could not put them back both together. *

The records of surgery fully prove, that dislocations of one condyle are the cases in which the reduction is attended with most difficulty, and the nature of the accident most likely to be overlooked, or mistaken.

Should the soft parts be considerably swelled, or the violent action of the muscles frustrate the first attempts at reduction, it would be right to bleed the patient from a large opening, and even take other measures for producing temporary faintness and prostration of strength.

The second indication, or that of keeping the bone from slipping out of its place again, is fulfilled by supporting the chin, and hindering its depression. The best contrivance for this purpose is the four-tailed bandage, applied as directed in speaking of fractures of the lower jaw. At the same time the patient is to be advised to refrain from speaking; not to attempt to masticate, but live for some time on liquids; to support his chin whenever a disposition to gape is experienced; and to avoid opening his mouth wide. These precautions merit strict attention; because, when the jaw is left unsupported, nothing is more common, than the displacement of the condyles again the first time the patient yawns, or opens his mouth wide; and in the course of a few minutes, several relapses have happened in the same individual.

DISLOCATION OF THE CLAVICLE.

Fractures of the clavicle are much more common than dislocations, as any one would infer, who considered the vast strength of the ligaments, the slender structure, and exposed position, of the bone, and the direction, in which an external

* Hey, Practical Observations in Surgery, p. 326. ed. 2.
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force would commonly operate upon it. A dislocation can more readily happen at the sternal, than the scapular, extremity of the clavicle, on account of the greater degree of motion, which takes place in the former situation, and the weaker structure of the ligaments. The accident more frequently and readily occurs in young subjects and females, in whom the articular cavity of the sternum is less deep and perfect, than in adults, or the male sex.* When a dislocation happens at the sternum, the clavicle is usually thrown forward; sometimes, however, backward; in which event, the symptoms may be severe and even dangerous, on account of the pressure produced by the bone on the parts situated in the anterior part of the neck. Thus one case has been lately recorded, in which the patient's life was endangered by the pressure upon the † œsophagus. A dislocation of the sternal end of the clavicle downwards is prevented by the situation of the cartilage of the first rib, immediately below the articular notch in the sternum, and a luxation directly upwards cannot happen, unless great force be applied to the outer end of the bone, so as to convert it into a kind of lever, with the first rib as its fulcrum; and, according to Professor Boyer, there are no instances to be met with of a dislocation either directly upwards, or directly downwards.

The dislocation of the sternal end of the clavicle forwards may arise from the sudden application of considerable force with a view of drawing back the shoulder, in which state the ligaments, and perhaps even a part of the lower tendon of the sterno-cleido-mastoideus muscle, are ruptured, and the inner head of the clavicle propelled forwards. As already remarked, the accident is more readily produced in young subjects. Boyer knew it happen in a young lady, when her shoulders were forcibly drawn back, in order to increase the grace of her deportment. The same cause would hardly produce the displacement in an adult; but, it is alleged, that the accident has really been known to take place in a grown-up person, whose shoulders were violently pulled back, while the trunk was fixed, or even propelled forwards by the knee being applied behind the chest. ‡

The luxation of the inner end of the clavicle forwards may also arise from a fall, in which the shoulder is forcibly driven backward.

* Boyer, *Traité des Maladies Chir.* t. iv. p. 156.

† A. Cooper, *Surgical Essays*, Part i. p. 4. The remark made by Boyer, that there is no unequivocal example on record of dislocation of the sternal end of the clavicle backwards, is incorrect.

‡ Boyer, *vol. cit.* p. 158.

The foregoing case is not of serious importance, never being attended with any urgent symptoms, though most of the ligaments of the joint are torn. It is true, that it is next to impossible to keep the bone exactly reduced, and some degree of deformity must remain; but the functions of the clavicle are not at all impaired by this circumstance; and when the pain is dispelled, and the ligaments consolidated, the use of the arm is perfect again. The luxation of the inner end of the clavicle forwards is reduced in the following way; the surgeon is to apply one hand to the inner and upper part of the arm, and the other to the external lower side of it above the elbow. The latter part is now to be inclined towards the trunk, while the upper end of the humerus is propelled outwards, by which means this bone is made to answer the purpose of a lever, the action of which immediately operates upon the clavicle. By these combined efforts of both hands, the shoulder is to be carried backwards and upwards, and the elbow forwards, so that the extension may be made in the oblique direction of the clavicle; that is to say, outwards, backwards, and a little upwards. The wedge-like cushion, used for fractures of this bone, is to be put under the axilla, as a point d'appui, which will tend to do permanently what the surgeon does with both his hands. However, if this extension should fail to bring the inner end of the clavicle into the articular cavity on the sternum, the reduction must be promoted by pressing the displaced part backwards. As soon as this is in its place again, the shoulder is to be inclined forwards, and the elbow backwards, in order to lessen the risk of the head of the bone slipping forwards again.* Lastly, the arm is to be confined in the eligible posture over the cushion by means of a roller applied round the member and the trunk, and the elbow and forearm are to be well supported in a sling.

The dislocation of the scapular end of the clavicle is always upwards; for, the root of the coracoid process will not allow the bone to descend below the acromion. The accident is generally the consequence of a fall upon the shoulder, the scapula being then suddenly and violently depressed, and fixed, as it were, against the ground, while the powerful action of the trapezius muscles pulls the clavicle upwards. The displacement, however, cannot happen, unless the ligaments tying the bones together be torn, and even some of those ligamentous bands, which connect the clavicle to the coracoid process. The case, now engaging our attention,

* Boyer, vol. cit. p. 161.

may be mistaken for a fracture of the clavicle; and, in consequence of the front and upper portion of the deltoid muscle becoming flattened, and there being an apparent depression at the top of the shoulder, it has sometimes been confounded with a dislocation of the humerus.

The reduction of a luxation of the outer end of the clavicle upwards is easily accomplished: for this purpose, the trapezius is to be relaxed, and the shoulder is to be inclined outwards, and raised, by making the humerus act in the desirable direction. At the same time, pressure is to be made upon the outer end of the clavicle, in order to adapt it to the inner and upper part of the acromion.

But, easy as the reduction is, the maintenance of it is extremely difficult, on account of the want of means for keeping the shoulder invariably raised, and the arm steadily fixed. Here also the least movement of the shoulder produces displacement, owing to the ligaments being torn, and the obliquity of the articular surfaces. Of course, the apparatus for keeping the end of the bone in its place should act in the same manner, as the power which effected the reduction; consequently, it should depress the outer end of the clavicle, raise the shoulder, incline it outwards, and hold the arm steadily against the side. Desault's apparatus for the fractured clavicle is regarded by Boyer as the best when used with a slight modification, which consists in alternately carrying the roller that goes under the elbow, both to the shoulder of the injured, and that of the uninjured side. *

DISLOCATIONS OF THE SHOULDER.

No bone in the body is so frequently dislocated as the humerus; a circumstance ascribable to the shallowness of the glenoid cavity of the scapula, the looseness of the capsular ligament, the varied and extensive movements of which the arm is capable, and the force of the impulse transmitted to the head of the bone in falls and other accidents, through so long a lever as is formed by the whole member, or even by the humerus alone. The providence of nature has indeed adopted some means for the prevention of the head of the humerus from being displaced. In the first place, the coracoid process, the acromion, and the triangular ligament connecting these parts together, form above the glenoid cavity a kind of arch, which receives a part of the head of the humerus,

* Boyer, *Traité des Maladies Chir*, t, iv, p, 172,

and retains it in its situation, when the arm is impelled from below upwards. Secondly, as the glenoid cavity of the scapula is of an oval shape, with its greatest diameter placed vertically, the elevation of the arm, the movement most frequently causing a luxation, may take place to a considerable extent, without the head of the bone, which then glides from above downwards in the glenoid cavity, ceasing to remain in contact with it. Thirdly, the tendon of the subscapularis muscle at the inner and forepart of the joint, that of the supra-spinatus above, and those of the infra-spinatus and teres minor below and behind, adhere so intimately to the capsular ligament, are so truly blended with it, and at the same time so connected with each other by dense cellular substance, that they constitute a very firm investment, well suited for resisting in a certain degree every displacement of the humerus at the points which they occupy. Fourthly, the movements of the arm do not altogether depend upon the shoulder-joint, but in a great measure upon the mobility of the scapula, which always moves together with the humerus and in the same direction: thus, in the most extensive motions of the arm, the humerus is rarely placed in a sufficiently oblique position upon the scapula to produce a dislocation. But, notwithstanding these many contrivances for strengthening the shoulder-joint, and lessening the risk of luxations of the humerus by the impulses to which it is subjected, experience proves, that these cases are very frequent, and upon an average as numerous as all other dislocations together.*

Having been rather full upon the present subject in the Dictionary, it is not my intention to repeat many of the statements, which are there made, but only to offer a brief enumeration of the different kinds of luxations of the shoulder, a short notice of their symptoms, and a few practical remarks, which have not been mentioned in the other publication.

The most common dislocation of the head of the humerus is that, in which it is thrown *downwards* into the axilla. This is what might be expected from a review of the structure of the joint, the capsular ligament being in this direction very loose and thin, and unsupported by any muscle. A displacement downwards would even be a more frequent accident than it is, were it not that the elevation of the arm, by which the head of the bone is inclined downwards, is not the most common movement of the limb; and that a sufficiently oblique position of the bone on the glenoid cavity for a dislocation to

* Boyer, Traité des Maladies Chir. tom. iv. p. 174, 175.

happen, is usually prevented by the scapula following and adapting itself to all the movements of the humerus.

In the dislocation downwards, the arm is lengthened, the elbow separated from the side, and the forearm is extended in consequence of the tension of the triceps muscle; the arm cannot be put near the body, nor the forearm be bent without pain; the acromion projects more than natural; a vacancy is distinguishable under this process; the fullness of the shoulder is lost, the deltoid muscle not being now duly supported by the head of the bone; the arm cannot be raised to a level with the acromion; and, lastly, the swelling caused by the head of the bone may be plainly felt in the axilla.

When the head of the humerus is thrown downwards, as is most frequently the case, it lies upon a very limited surface, quite disproportionate to its size. Hence, any exertion, or impulse, the weight of the limb itself, and the action of the muscles, are likely to produce another change in the situation of the head of the bone, which Petit erroneously supposed might be drawn from the axilla; either backwards, or forwards indifferently. As Boyer * has remarked, however, this mistaken notion could only proceed from inattention to the exact situation of the head of the humerus, with regard to the surrounding muscles; for, as the long head of the triceps is attached below the neck of the scapula, and is constantly situated just on the outside of the head of the humerus in the dislocation downwards, a secondary change in the position of the latter part can happen only in the direction inwards, under the great pectoral muscle. Boyer has had several opportunities of dissecting luxated shoulders, and he avers, that, in the dislocation downwards, he has invariably found the head of the bone situated between the long head of the triceps, and the subscapularis muscle, resting upon the inside of the front edge of the scapula. †

The dislocation into the axilla is usually the consequence of external violence, combined with a powerful sudden contraction of the pectoralis major, latissimus dorsi, and teres major muscles. The accident frequently happens from falls, in which the elbow strikes against the ground, while separated from the side of the trunk. When a person falls sideways, he naturally puts out his arm in order to hinder his head from striking the ground. In this situation, the weight of the body is, upon the shoulder-joint; and, as, at the same

* *Traité des Maladies Chir.* tom. iv. p. 180.

† Vol. cit. p. 185.

instantly the pectoralis major, latissimus dorsi, and teres major, act strongly and pull the arm forcibly towards the chest, they make the head of the humerus slip out of its cavity, because the elbow rests upon the ground as a fixed point, while the upper end of the bone is the moveable one.

On many occasions, however, the head of the humerus is dislocated downwards; not exactly in the foregoing manner, in which the elbow is fixed against the ground, or some other surface with which it comes into contact in the fall: thus, an ostler, in putting on a bridle, often has his arm dislocated by the horse suddenly throwing up its head, and striking the under part of the elbow, while raised from the side of the body. In this last instance, the lower end of the humerus is violently thrown up, and its head propelled down into the axilla, the movement being like that of a lever:

The records of surgery furnish proofs, also, that the humerus may be luxated solely by the action of the muscles, without any fall, or external violence being concerned in producing the accident: for, cases are related, in which the arm was dislocated into the axilla by merely lifting up a weight, or the convulsed action of the muscles in attacks of epilepsy.*

In cases of dislocation of the shoulder, the capsular ligament is very extensively torn, and one remark is made by Professor Boyer, which is of importance, viz. that in dissections he has constantly found the lacerated opening in the capsule quite large enough to allow of the easy return of the head of the bone into its natural situation. This observation, which is at variance with the statements of Desault, is confirmed by Mr. A. Cooper, who, in noticing the supposed impediment to reduction from the capsular ligament, takes the opportunity of declaring, that those who entertain the opinion, must forget the inelastic structure of capsular ligaments, and never have ascertained by dissection the extensive laceration, which they sustain in dislocations from violence.†

In the dislocation downwards, the tendon of the subscapularis is ruptured. The tendons of the supra and infra-spinatus muscles may likewise be torn from the bone, and with them a shell of the head of the humerus may be detached.‡ Writers do not agree in their accounts of what becomes of the tendon

Boyer, *Traité des Maladies des Os*, tom. iv. p. 181, 182.

† A. Cooper, *Surgical Essays*, Part i. p. 18. Thompson found the capsular ligament entirely torn off from the neck of the humerus. See *Med. Obs. and Inquiries*.

‡ Thompson in *Medical Observations and Inquiries*, and Hey's *Practical Observations in Surgery*, p. 311. ed. 2.

of the long head of the biceps. According to some reports, it is displaced from its groove; according to others, it is actually ruptured. Mr. Hey tells us, that he once saw a compound dislocation of the os humeri, where the head of the bone protruded through the integuments in the axilla; and, in this case, the long tendon of the biceps was torn from its groove in the neck of the bone. However, it may be inferred, that, in ordinary dislocations downwards, this tendon is neither torn, nor displaced from its groove; for, Professor Boyer has never seen either occurrence in the cases which he has dissected*; and Mr. A. Cooper says that, as far as he has had an opportunity of judging from dissection, the same tendon remains unbroken.†

The dislocation next in frequency to that downwards, is the case, in which the head of the humerus breaks through the internal portion of the capsular ligament, and passes immediately under the great pectoral muscle, constituting the *primitive luxation inwards*.

Of the *consecutive* dislocation inwards, or that which arises from the head of the bone quitting the axilla, the situation into which it was originally thrown, and passing under the great pectoral muscle, I have already spoken.

The primitive dislocation inwards generally happens as follows: when the arm is raised so as to form nearly a right angle with the trunk, and the elbow is inclined backwards, a fall on the side may drive the head of the humerus through the inner part of the capsular ligament. In this kind of accident, the resistance of the ground operates very obliquely upon the elbow, and, consequently, a great part of the violence is lost: hence, one reason, why the dislocation inwards is less commonly met with than that downwards; and a second cause of this difference, as Boyer observes, may be found in the little power, which the muscles have to contribute to the displacement, owing to their direction with regard to the bone itself.

A primitive luxation inwards appears also to be subject to a consecutive displacement, by which the head of the humerus is drawn more upwards towards the coracoid process, and the clavicle; but, it is asserted by one modern writer of eminence, that the head of the bone is never pulled up quite under the clavicle, though he says, that he has seen a singular instance, in which the head of the humerus was broken off from the

* *Traité des Maladies Chir.* t. iv. p. 186.

† *Surgical Essays*, Part i. p. 5.

rest of the bone, dislocated forwards, and so moveable under the pectoral muscles, that it could readily be pushed up under the clavicle. In this case, an artificial joint was formed between the end of the main portion of the humerus and the scapula; but, the arm had but little motion. *

In the dislocation inwards, the length of the limb is not much altered, and, if changed at all, it is somewhat diminished. The forearm is not fixed in the half-bent position, because the muscles are less stretched, than in the luxation downwards. The direction of the arm is downwards and backwards. The flatness of the shoulder, and the depression formed by the glenoid cavity, are not very obvious, excepting towards the back of the joint. The head of the humerus seems to be as much under the coracoid process, as in the axilla, and that it is situated more towards the median line, than the neck of the scapula, is quite manifest. The movement, in which the elbow is carried forwards, is attended with the greatest difficulty, and that, in which the limb is inclined in the opposite direction, the least painful.

Many surgical authors believe, that the head of the humerus cannot be dislocated backwards. "No force," says Mr. C. Bell, "can be applied in a direction to dislocate the humerus, and push its head behind the scapula, for this very evident reason, that the chest prevents the necessary position of the humerus."† But, though an accident of this description is very uncommon, all such writers as absolutely deny its possibility, are themselves venturing beyond the bounds of accuracy. A few cases, in which the head of the humerus was dislocated backwards under the spine of the scapula, may now be found in the voluminous records of the profession. Thus, M. Fizeau‡ has detailed one rare instance, which was also witnessed by Professor Boyer. In the case here alluded to, the bone, after its reduction, was observed to have a remarkable tendency to slip out of its place again; a circumstance, which led Boyer to suppose that there was some malformation of the joint. As, however, a disposition to relapse is more or less common after all luxations of the shoulder, it does not appear to me, that there was any strong reason for the foregoing suspicion, especially as there are other cases to be met with

* Delpech, *Précis Elementaire des Maladies réputées Chirurgicales*, tom. iii. p. 72. 8vo. Paris, 1816.

† *Operative Surgery*, vol. ii. p. 239.

‡ *Journal de Medecine, Chirurgie, Pharmacie, &c.* par M. M. Corvisart, Le Roux, Boyer, &c. tom. x. p. 386.

of a similar displacement, unaccompanied with any ground for such a conjecture. I have said, that, in this uncommon kind of luxation the head of the bone is lodged under the spine of the scapula: and in one case dissected by Delpach, the head of the bone lay under the infraspinatus muscle, in immediate contact with the scapula: *

The head of the humerus is sometimes dislocated by violence directly applied to the shoulder, and, according to Professor Boyer, in all cases of this sort, either the scapula or the humerus is also fractured. The particulars of a dislocation of the humerus backwards, produced in this manner, and attended with a fracture of the anatomical neck of the bone, were not long ago communicated to Boyer by Dr. Houzelot, of Meaux, and the first of these gentlemen has in his possession two drawings of the case, taken from nature by one of his pupils. †

Dislocations of the os humeri, with fracture of the head of that bone, are by no means very uncommon cases: a preparation, exhibiting such an occurrence, may be seen in the anatomical museum at St. Thomas's hospital. ‡

Paralysis of the arm is sometimes the consequence of a dislocation downwards, or inwards, and is supposed to proceed from injury done to the axillary plexus of nerves by the head of the humerus. This paralytic affection may remain for ever incurable, may get well spontaneously, or yield to stimulating liniments, blisters, issues, or the moxa. A still more frequent ill effect of luxations of the shoulder is paralysis of the deltoid muscle; an infirmity ascribed by some writers to laceration of the circumflex nerve: §

Many of the old methods of reducing dislocations of the shoulder consisted altogether of means, which acted directly upon the head of the humerus, and operated upon the principle of impelling it back into the glenoid cavity of the scapula by the shortest and straightest route, without the least regard for intervening impediments. In most of these plans either a fulcrum or an active force was applied in the axilla, and the weight of the body was then employed, as a means of propelling the head of the bone upwards, the arm being kept in a vertical position, parallel to the axis of the body. Here, it is plain, that no attempt was made to separate the head of the humerus

* Précis des Maladies réputées Chirurgicales, tom. iii. p. 72.

† Boyer, Traité des Maladies Chirurgicales, tom. iv. p. 185.

‡ A. Cooper's Surgical Essays, Part i. p. 12.

§ Delpach, Précis des Maladies Chir. t. iii. p. 73.

from the lower edge of the scapula, previously to the effort to get it back into the glenoid cavity; and two of the most important principles in the reduction of dislocations in general were totally neglected, as neither extension, nor counter-extension, was practised. If it sometimes happened, that with force thus unskilfully exerted, dislocations downwards were reduced, the same practice offered no chance of success in other instances, in which the head of the humerus was either primitively or consecutively displaced inwards and forwards. In the above mode of proceeding, as the arm was placed by the side, and the shoulder drawn downwards by the weight of the whole body, the displacement in the latter kind of luxation could not fail to be increased, all the force operating upon the soft parts surrounding the head of the bone, or on the neck of the scapula, or upper portion of the humerus itself. Hence, violent contusion, lacerations; and fractures, were not unfrequently produced.

However, there can be no doubt, that the methods, which aimed directly at the reduction, without any previous extension and counter-extension, sometimes answered, or the common sense of the world would not have permitted the practice to have gone on for many ages. But, success was probably only attained, where the dislocation was downwards, the head of the humerus far removed from the glenoid cavity, and little opposition made by the muscles, the patient being either in liquor, or exhausted with fatigue. Once, as Professor Boyer was handling the humerus of a drunken postillion while the assistants were preparing the apparatus for reduction, the bone slipped into its place again, without any extension, or counter-extension, being made.* Even when patients are neither faint, debilitated, nor under the influence of strong drink, if the head of the humerus be in the axilla, the reduction may sometimes be executed with a very trivial degree of extension. Thus in the case of a corpulent woman, whose shoulder was dislocated downwards, as Mr. Hey was directing the assistants to keep the arm elevated at a right angle with the body, previously to beginning the extension, they put the arm a little upon the stretch, and on pressing on the head of the bone with his fingers in the axilla, the reduction was unexpectedly accomplished.† The same excellent practitioner once saw a luxated shoulder reduced by the

* *Traité des Maladies Chirurgicales*, t. iv. p. 196.

† See Hey's *Practical Observations in Surgery*, p. 295. also the case p. 296. *éd. 2.*

mere efforts of the patient : this was an instance, in which the hand was accidentally placed on the back of a low chair, while the patient was moving his body about in different directions. *

The ambi of Hippocrates was unquestionably a better means of reduction, than the door, or ladder-process ; but from the account of it delivered in the Dictionary, the reader will perceive, that the ambi made only insufficient extension, its operation being that of a lever, by which the head of the bone was raised very nearly in a direct line upwards, and but in a little degree outwards, while nothing was done in the way of counter-extension either with regard to the trunk or the scapula. The old mode of reduction, effected by placing the heel in the axilla, and making extension at the wrist, is to be regarded as the best of the ancient methods. The heel makes a fulcrum, on which the head of the humerus may be moved out by approximating the elbow to the side ; the heel also serves for fixing the trunk, in lieu of the usual mode of counter-extension ; and the surgeon himself makes extension at the wrist. The only disadvantages, which can be pointed out in this method, depend perhaps on the scapula not being fixed, and on the extension not always being powerful enough. It is a practice, however, which Mr. A. Cooper speaks of in favourable terms ; he says, indeed, that he generally reduces dislocations of the shoulder by placing the heel in the axilla, and drawing the arm at the wrist, in a line with the side of the body ; and, he points out one reason for choosing to make the extension in this manner ; viz. that when the arm is placed close by the side, the pectoralis major and latissimus dorsi muscles are relaxed, and cannot make so much resistance, as when the arm is carried from the side. †

Notwithstanding the records of surgery afford numerous proofs of the occasional ready and spontaneous reduction of the dislocated humerus, the surgeon must not expect the generality of cases to be rectified with the facility which happened in the examples cited from the practice of Professor Boyer, and Mr. Hey. ‡ On the contrary, it will be necessary to establish certain principles, without due attention to which the strongest efforts may sometimes fail.

As a general principle, then, I may assert with Boyer, that

* Op. cit. p. 297.

† A. Cooper's Surgical Essays, Part i. p. 25.

‡ See also "Cases with Observations on Wryneck ; on the Reduction of Luxations of the Shoulder-Joint, &c. &c." by John Kirby, 8vo. Lond. 1819.

extension and counter-extension make an essential part of every unobjectionable process for the reduction of dislocations of the shoulder. In France, the extending force is usually applied to the wrist; in this country, just above the condyles of the humerus.* The counter-extension embraces two objects, viz. that of fixing the trunk, and that of preventing the scapula from yielding in the direction of the extending power.

The trunk is usually fixed by means of a sheet, or table cloth, put round the chest, and the ends of which are either held by one or more assistants, or fastened to a post, or any other immoveable point. The scapula may be kept back either by an assistant pressing against the acromion, and scapular end of the clavicle, or with a napkin folded longitudinally, applied over the same parts, and drawn in the opposite direction to that of the extending force.

Whether the extension be made at the wrist, or at the lower end of the humerus, the soft parts should be protected from the effects of the pressure with flannel, or a few turns of a wet callico roller, over which the longitudinally folded table-cloth or sheet, or the quilted leather of the multiplied pulley employed for making the extension, may be placed.

Nothing can be more vague and confused, than the instructions offered in the latest practical works, respecting the direction, in which the extension ought to be made. One principle, however, is never to be forgotten, as it is a most useful guide: viz. the first design should not be to force the head of the humerus towards the glenoid cavity, but to extricate it from below the neck, or costa of the scapula, or from the track which it has taken underneath the pectoral muscle, so that the intervening parts may not constitute an impediment, which cannot be overcome without great violence, and unnecessary injury.

According to Boyer, when the dislocation is downwards, the extension should be made directly outwards, and the arm afterwards inclined downwards and a little forwards, until it touches the side. The surgeon must be careful to guide the movement, by which the assistants change the direction of the extension; and, in proportion as the wrist is inclined downwards, he is to press with his abdomen on the external

* One advantage of applying the extending force above the elbow, is the opportunity of relaxing the biceps; for "since that muscle is attached to the neck and coracoid process of the scapula, an extended state of the arm must hinder the repressing of the articular cavity." Hey's Practical Observations in Surgery, p. 300.

side of the elbow, while, with both his hands applied to the inner and upper part of the humerus, he inclines the head of the bone upwards and a little backwards. The success of these manœuvres will depend in a great measure upon the extension and counter-extension being well proportioned to each other, and regulated so as to promote the movements, which it is the duty of the surgeon to communicate to the limb during the operation.

When the dislocation is inwards, Boyer recommends the extension to be made horizontally outwards and a little backwards; and the limb is afterwards to be inclined forwards and downwards, until it is brought obliquely over the front of the chest. But, previously to the arrival of the member in the last position, the operator is to press with one of his hands upon the back of the elbow, and with the other, upon the front and upper part of the humerus, in order to push the head of the bone outwards, and direct it into the glenoid cavity of the scapula.

Were the case originally a dislocation downwards, or inwards, but the head of the bone now in a state of consecutive, or secondary displacement inwards, or upwards, the aim of the surgeon should be first to bring the head of the humerus down into the axilla, and then to guide it over the lower part of the brim of the glenoid cavity, where the capsular ligament was torn at the moment of the accident.*

When the head of the bone has deserted the axilla, and slipped under the pectoral muscle, Mr. Hey has observed, that it is brought back into the axilla more readily, if the extension be made in a direction opposite to that in which it has passed from the axilla; and that success is often greatly promoted by making the extension with the arm elevated, as advised by Mr. White. But when the head of the bone has advanced far under the pectoral muscle, Mr. Hey conceives, that strong extension may sometimes hinder the reduction by closing the passage, through which the head of the bone should return, and, in such cases, he is an advocate for combining moderate extension, with the plan of moving the head of the bone freely about in all directions, pressure being also employed at the proper crisis for inclining it towards the glenoid cavity.†

Mr. Hey has noticed the occasional impediment to reduction caused by the pressure of the edge of the glenoid cavity against the neck of the humerus. If the extension be made

* Boyer, *Traité des Maladies Chir.* tom. iv. p. 203—205.

† See Hey's *Practical Observations in Surgery*, p. 311, &c. ed. 2.

horizontally, the hindrance, he observes, will be increased, in proportion to the depression of the acromion. In order to obviate the difficulty, he says, the head of the humerus must be lowered by elevating the arm, while the edge of the glenoid cavity must be separated from the humerus by depressing the acromion.

Whether the extending force be applied in the French manner to the wrist, or, (as is generally done in this country) just above the elbow, the position and inclination of the humerus during the operation should be the same. In short, while the extension and counter-extension are kept up by the assistants, the limb, or the humerus itself, is to be employed by the surgeon as a lever for moving the head of the bone gradually towards the glenoid cavity. In Boyer's account, we see, that this principle is acted upon, the elbow and wrist being inclined in particular directions, while the surgeon forms with his hands a kind of fulcrum, or active resistance at the upper part of the humerus. When the extension has been performed in a certain degree, many surgeons make a still more efficient fulcrum by directing one of the assistants to draw up the upper portion of the humerus with a towel placed under the member just on the outside of the axilla. Others execute the same purpose by letting the ends of the towel, or table-cloth, be fastened over the back part of their necks, which they draw back at the period, when it is desired to keep well up the superior portion of the humerus.

An excellent general rule in reducing dislocated shoulders, is to make the extension in a gradual, regular, and unremitting manner, without any immoderate sudden violence.* In this way, the muscles of the most athletic man may be overcome, while extension, so powerful as to be attended with risk of tearing the flesh, will fail, if not maintained for a certain time without the slightest relaxation. When the head of the bone has been brought near the glenoid cavity, the extending force should always be gradually lessened, as the lever-movement of the limb, and the action of the muscles themselves, are then the means, by which the head of the bone will be replaced.

According to Professor Boyer, when the head of the humerus has been dislocated a month, or six weeks, its re-

* "In all cases, the more slowly the extension is made, the more will the resistance of the muscles be eluded, the probability of success will be increased; and the patient will not suffer any degree of unnecessary pain." Hey's *Pract. Obs. in Surgery*, p. 296.

duction is seldom practicable. But, as experience proves, that the bone has been sometimes replaced at a much later period, it would be culpable not to make the attempt. A modern practical writer informs us, that he has in some cases reduced the humerus, after it had been dislocated two or three months, and, in one example, six months after the accident. *

Mr. Kirby appears to entertain a just dislike to the employment of too much violence in reducing dislocations of long standing, and, on this account, he seems generally to disapprove of the use of pulleys. His method is as follows: he provides himself with a piece of strong coarse linen, a yard in breadth, and not less than three yards in length. Along its centre, he makes a slit, sufficiently large to admit the luxated member, which is passed through it up to the shoulder-joint. Each end is then twisted two or three times, or oftener, until the upper division of the band bears upon the acromion process, and its inferior part acts upon the remainder of the scapula, so as to fix this bone together with the trunk. The ends of the bandage are next given into the hands of an assistant.

The ligature which Mr. Hey has described, is now applied above the condyles of the humerus. It consists of a piece of linen, or calico, about three yards in length, and half a yard in breadth. It is to be folded longitudinally, until its breadth is reduced to about three inches. Its middle is to be doubled in an elliptical form, and put round the limb, until it nearly meets, when one tail is to be conveyed through the noose on the opposite side, and the other tail through the same noose on the further side of the limb from itself. The tails are next taken hold of for making the extension. †

In applying this bandage, care must be taken, that the skin form no plait, nor fold, and that it be first covered with some shamoy leather, for the purpose of protecting it from excoriation.

The patient now sits upon a mattress, which is laid out on the floor, and the assistants, to whose management the extension and counter-extension are consigned, sit opposite one another on the floor at his sides. Each puts one leg under the patient's hams, until the soles of the feet meet together, while the other legs are extended towards each other, until they meet similarly behind him. If occasion should require a greater power, the number of assistants may be increased.

* John Kirby, *Cases, with Observations on Wryneck; the Reduction of Luxations of the Shoulder, &c.* p. 53. 8vo. Lond. 1819.

† Hey's *Practical Observations in Surgery*, p. 294. ed. 2.

The extension is now made, with the arm raised to nearly a right angle with the body, and in a direction forward, or backward, as the case may require. This plan is continued, until the head of the bone is dislodged from its new situation, when the assistants are slowly to relax their force, and the head of the humerus may be directed towards the glenoid cavity with one hand, while the other gently depresses the elbow towards the side.

Mr. Kirby very properly joins all the best practical surgeons of the present day in censuring the useless and injurious practice of making sudden jerks in the operation; and he is right, I think, in recommending long, steady perseverance, instead of attempts renewed at intervals. *

Although I believe the employment of pulleys commendable in the hands of a skilful prudent surgeon, and, in cases where force must be used, am inclined to prefer them to other extending means, they unquestionably require caution, lest the force exerted be such as to cause a danger of the soft parts being torn, the axillary artery ruptured, or the limb so much hurt that the risk of mortification is incurred. When Loder was studying at the Hotel Dieu at Rouen, a man came to the hospital, on account of some trifling complaint. The celebrated M. David, then the principal surgeon of that establishment, perceived that the patient had also a dislocation of the left arm. The displacement had already existed several months, and the limb had acquired some degree of mobility. M. David recommended making a fresh trial to reduce the bone, and the patient's consent being obtained, the attempt was made with immense force, and the arm restored to its proper place again; but, the event was most disastrous; for the whole limb was attacked with such violent pain and inflammation, that, notwithstanding every means which surgery could suggest was immediately put in practice, mortification ensued, and the patient lost his life. †

For the purpose of preventing the head of the humerus from slipping out of its place again, (a tendency which always lasts for two or three weeks after the reduction,) a sling should be worn, and the arm kept close to the side.

When a dislocation is accompanied with a fracture of the humerus, the reduction is generally impracticable, especially when the solution of continuity in the bone happens to be

* Cases, with Observations, on Wryneck; the Reduction of Luxations of the Shoulder, &c. p. 54—57.

† Chirurgisch-Medicinische Beobachtungen, p. 175. 8vo. Weimar, 1794.
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very near the shoulder-joint. However, in a modern * work, mention is made of one instance, in which a fracture of the neck of a dislocated humerus did not prevent the reduction, which was accomplished by means of a tourniquet applied over the shoulder and under the head of the bone.

DISLOCATIONS OF THE ELBOW.

It is almost impossible for the bones of the forearm to be thrown forwards, without the olecranon being broken, and probably the resistance of the latter part is one principal reason why such a displacement is very uncommon.† The kind of dislocation most frequently occurring at the elbow, is that in which the upper heads of the radius and ulna are displaced backward. This accident is facilitated by the small size of the coronoid process, which slips behind the os humeri into the lower portion of the cavity, naturally destined for the reception of the olecranon in the extended state of the forearm. However, in some instances, the coronoid process is fractured; a complication, which is said not to admit of the ulna being preserved in its natural situation.‡ The lower end of the humerus is situated upon the anterior surface of the radius and ulna, between the coronoid process and the insertion of the tendon of the biceps muscle; and the lateral ligaments are torn. The fibres of the anconæus and brachialis also probably suffer the same fate. The olecranon and part of the biceps project backward to an unusual distance, causing an appearance, as if the arm were broken above its lower third. The biceps, pronator teres, supinator brevis, and triceps, are all in a state of tension; and, in consequence of the forearm being thus drawn in opposite directions by the antagonist muscles, it remains in a half-bent position. There are particular instances of this kind of dislocation, where the displacement is much more extensive, and the injury of the soft parts far more considerable, than what is above described. Thus, the lower end of the humerus may be thrown further from the elbow, along the anterior surface of the radius and ulna, which displacement cannot happen without the laceration of several of the preceding muscles. In cases of this description, the humerus has sometimes been driven through the integu-

* Delpech, Précis des Maladies réputées Chirurgicales, tom. iii. p. 80.

† Only a single instance of this luxation, unaccompanied with fracture of the olecranon, is said to be upon record. Delpech, Précis Elementaire des Maladies réputées Chirurgicales, tom. iii. p. 81.

‡ A. Cooper, Surgical Essays, Part i. p. 12.

ments, and even the brachial artery has been ruptured, which last injury one would expect to be more frequent than experience proves it to be, considering the relative situation of the vessel to the elbow-joint. *

The next most frequent dislocation at the elbow consists in the ulna being pushed into the place of the radius upon the lower end of the humerus. In this case, the olecranon is brought nearer to the external condyle, the distance between the olecranon and internal condyle being of course much greater than natural; and, as these projecting points of bone can hardly ever be obscured by any degree of swelling of the soft parts, they are, in accidental injuries of the elbow-joint, important sources of information to every surgeon duly acquainted with anatomy. From the perusal of books, one might suppose that all dislocations at the elbow were so obvious, as not to admit of the possibility of mistake. However, this is far from being true; for, such accidents are rarely produced without great violence, the usual consequence of which is a rapid and considerable swelling, by which the form of the joint is very much concealed. I have myself seen several cases of luxations of the elbow, where the patients were permanently crippled, because the nature of the accidents had not been understood at first, and no attempt at reduction made time enough to be of service. One common cause of mistake is the feel of a crepitus, when the forearm is moved, and the surgeon is led by this circumstance to suppose the case a fracture; but, he should remember well that most dislocations at the elbow are attended, as well as fractures, with this symptom. An error in the early management of luxations of the elbow is the more serious, as all dislocations of ginglymoid joints much sooner become irreducible, than those of the orbicular ones. I once saw a young gentleman, whose ulna had been pushed into the place of the radius on the humerus about a month, yet the efforts of two very eminent surgeons in London could not now produce the slightest diminution of the displacement.

In the last-mentioned kind of dislocation, or the lateral luxation of the head of the ulna outwards, the radius is invariably pushed off the lesser articular surface of the humerus; this surface and the outer side of the articular pulley being now in contact with the sigmoid cavity of the ulna. The internal portion of the trochlea of the humerus is no longer applied to the ulna, and forms a prominence at the inner side of the

* Delpech, vol. cit. p. 82.

elbow, while the olecranon and coronoid process, being propelled outwards, do not correspond to the cavities in the humerus naturally intended for their reception; and hence, they seriously limit the flexion and extension of the forearm. As the point of the olecranon constantly touches the back of the humerus, the forearm remains slightly bent; and the brachialis, biceps, and triceps, are in a state of tension, drawn outwards. A similar derangement of the pronator teres, and of nearly all the muscles situated on the palmar side of the forearm, will also explain the fixed pronation of the hand, and the bent state of the fingers.*

The lateral dislocation of the heads of the ulna and radius inwards is more uncommon and generally incomplete, as indeed is the case with respect to the preceding example. The student will recollect, that by the term *incomplete*, in reference to luxations, surgeons mean that the articular surfaces are still in partial contact; a state, which is well accounted for, in lateral dislocations of the elbow, by the great extent of the surfaces of this joint in the transverse direction. In the dislocation inwards, the upper head of the radius is thrown upon the trochlea of the humerus, and more or less of the sigmoid cavity of the ulna is forced away from the latter bone, and forms a projection at the inside of the elbow. The olecranon and coronoid process being now placed more internally, than the depressions destined for them in the humerus, cannot freely execute their usual movements, more especially the olecranon, which being the longest of the two, keeps the arm constantly bent, though in a less degree than in the lateral dislocation outwards. The short supinator, being on the stretch, rotates the radius outwards; while the brachialis, biceps, and triceps, are displaced inwards and very prominent. Lastly, the olecranon is much nearer the inner condyle, than natural. Lateral dislocations of the upper heads of the radius and ulna are always attended with rupture of the lateral ligaments, and generally also with a laceration of the annular ligament of the radius, which is so intimately connected with the external lateral ligament, as to be as it were a part or production of it. That it is frequently torn, is proved by the fact, that after a lateral dislocation of the elbow has been reduced, it is not at all uncommon for the surgeon to perceive a distinct luxation of the radius yet claiming his assistance. And, as Delpech observes, the radius and ulna can only

* Delpech, Précis Élémentaire des Maladies Chirurgicales, tom. iii. p. 83

preserve their due relation to each other in dislocations of the elbow, when the external lateral ligament happens to break above its connection with the annular ligament of the radius. *

Besides the kinds of luxation at the elbow already specified, other cases happen which are not taken the least notice of by the generality of writers: I here allude to examples, in which the radius is driven forwards, and the ulna backwards, with or without a fracture of the coronoid process. More than one accident of this kind was brought to St. Bartholomew's hospital in the course of my apprenticeship at that institution.

When proper extension is made, recent dislocations of the elbow are easily reduced. For this purpose, an assistant is to take hold of the arm above the joint and fix the humerus, while another assistant makes the requisite extension at the wrist in the axis of the displaced forearm. At the same time the surgeon is to promote the reduction by pressing the heads of the ulna and radius in the desirable direction.

The arm should afterwards be kept in a sling; and if there be much swelling of the soft parts, venesection, leeches, cold washes, low diet, and purging, will be proper. In these cases, there is not much tendency to displacement again; but if, from the separation of the articular surfaces having been greater than usual, and attended with extensive laceration of the ligaments and muscles, and fracture of the coronoid process, the joint should appear to require mechanical support, it must be obtained from the use of a bandage, compresses, and splints. In general, however, the pressure of any apparatus is injurious in the early stage, while inflammation is present, and afterwards it becomes unnecessary, with any view to the prevention of another displacement.

As soon as the inflammation and swelling have subsided, the forearm should be gently bent and extended every day, in order to hinder ankylosis. †

DISLOCATIONS OF THE METACARPAL BONE OF THE THUMB FROM THE OS TRAPEZIUM.

The first metacarpal bone, which is articulated only with one bone of the carpus, viz. the os trapezium, and performs

* Précis Elémentaire des Maladies Chirurgicales, tom. iii. p. 85.

† Upon dislocations of the radius from the ulna, and those of the wrist, os magnum of the carpus, and fingers, I have nothing to say at present, in addition to the remarks contained in the last edition of the Dictionary.

the several movements of flexion, extension, abduction, and adduction, is liable to displacement; but, as such an accident cannot be produced except by some force, which operates directly on the first metacarpal bone itself, while force, applied directly to the thumb, sooner occasions a dislocation of its first phalanx, than a luxation of the metacarpal bone, the latter case is uncommon.

Although from the various directions in which the metacarpal bone of the thumb is moveable, we might suppose, that it could be dislocated off the trapezium either backwards, forwards, inwards, or outwards, the first is the only case which has yet been observed. The usual cause of such displacement is external violence, by which the metacarpal bone is suddenly and immoderately bent towards the palm, as may occur in a fall upon the radial edge of the hand.

The nature of the accident may be known by the tumour formed by the displaced head of the bone; by the flexion of the thumb and metacarpal bone; by the impossibility of extending them; and the pain accompanying every such attempt. The considerable swelling, which soon follows, sometimes obscures the case; and, if in this circumstance, the surgeon merely adopt measures for the removal of the inflammation, the bone either becomes in a short time irreducible, or, if reducible, a permanent tendency to slip out of its place again is left as the effect of the consolidation of the capsular ligament, while the bone was in a state of displacement.

The reduction of a dislocation of the metacarpal bone of the thumb backwards is accomplished as follows: while one assistant pulls the thumb, and another fixes the hand, by taking hold of the wrist, the surgeon compresses with both his thumbs the displaced head of the bone, and pushes it towards the palm into its natural situation again. Some linen wet with the liquor plumbi acetatis dilutus may then be applied round the part, and a return of the displacement is to be prevented by laying a compress and piece of strong paste-board, or a small wooden splint, along the posterior surface of the bone, and properly securing the apparatus with tape.*

DISLOCATIONS OF THE THUMB.

With respect to these cases, I am anxious to notice a few particulars, which escaped my attention when I was last employed in revising the Dictionary.

* Boyer, *Traité des Maladies Chirurgicales*, tom. iv. p. 268.

The phalanges of the thumb are most liable to be dislocated backwards, and, in certain individuals, the tendency to this kind of displacement is so considerable, that they can produce and remove it at pleasure by the mere contraction of the muscles. In a letter, dated the 6th of February, 1819, and received by me from Mr. Dunn, an intelligent surgeon now settled at Scarborough, (to whom I here beg leave to acknowledge my obligations for many other valuable communications,) he says " my pupil, who has written this copy of my letter to you, can spontaneously dislocate the thumb of his left hand at the metacarpal joint by the action of the flexors alone, the metacarpal bone being the upper. By the action of the extensors, he can again replace it; but, the least extension of the thumb by an assistant, or himself, gives him great pain; without accomplishing the reduction. He can by the same means dislocate the second phalanx of the thumb from the first. He complains of no weakness in his hand, and, indeed, can exercise the left hand better than the right." Boyer tells us, that he has met with several persons, in whom the first phalanx of the thumb had this tendency to slip backwards; and he professes his inability to say, whether it depended upon relaxation of the ligaments, or particular conformation of the articular surfaces. *

Without any disposition of the foregoing nature, the first phalanx of the thumb is apt to be dislocated backward by external violence, so applied as to occasion a forcible and immoderate extension of the joint. In this circumstance, the base of the phalanx glides backward behind the head of the first metacarpal bone, lacerating the capsular ligament, stretching the tendons of the extensor muscles, and changing the direction of the lateral ligaments, without breaking them.

The nature of the case may be known by the head of the first phalanx of the thumb projecting back, so as to form nearly a right angle with the metacarpal bone; by the tumour produced in front of the joint by the head of the latter bone; by the bent position of the second phalanx caused by the tense state of the tendon of the flexor longus pollicis; and by the impossibility of either bending or extending the first phalanx. †

In many surgical books, the reduction of the first phalanx of the thumb, when thrown backwards off the head of the

* Boyer, *Traité des Maladies Chir.* tom. iv. p. 273.

† Boyer, *ibid.*

metacarpal bone, is described as attended with no difficulty, when done soon after the occurrence of the accident; but, all writers agree, that if the case be neglected, it quickly becomes irreducible. The latter part of this statement appears perfectly correct, the loss of a little time putting an end to all hope of reduction by common means, as we find exemplified in a case, which happened in the practice of Professor Boyer, who was completely foiled in his endeavours to reduce such a luxation, though it had existed only ten days.

With regard to the general facility of reduction in an earlier stage, modern experience appears to prove, that even this is far from being the truth; and, according to the observations of the late Mr. Hey *, a peculiar difficulty attends the reduction, whenever the head of the metacarpal bone, which is joined to the first phalanx of the thumb, is completely luxated, and depressed towards the palm of the hand. He informs us, that, when he was a pupil at St. George's hospital in 1758, a patient with such an accident was dismissed incurable; Mr. Bromfield at the same time stating to the pupils another instance, in which the extending force had been increased to such a degree, that the surgeon tore off the thumb at the second joint. Nor could Mr. Hey himself, by means of extension and pressure, or twisting the bone about, accomplish the reduction of a similar case, which was brought to him by another surgeon in 1767.

The cause of the difficulty in the reduction is variously explained by different writers. Boyer refers it partly to the little space which the thumb presents for the counter-extension, and partly to the resistance made by the strong muscles around the joint. † On the contrary, Mr. Hey, in endeavouring to account for the impediment, adverts to the wedge-like shape of a transverse section of the head of the metacarpal bone, with the narrowest part towards the palm of the hand, and makes some reflections on the effect of the position of the tubercles situated upon the head of the same bone, the two nearest the palm being only $\frac{3}{4}$ ths of an inch from each other, while those towards the back of the bone have an interspace of $\frac{1}{2}$ ths of an inch. Supposing therefore the head of the metacarpal bone to be pressed forcibly between the lateral ligaments, towards the palm of the hand, it passes like a wedge between these ligaments; and having passed between them, it cannot return, as the posterior broad part of the

* See Hey's *Practical Observations in Surgery*, p. 327. edit. 2.

† Boyer, *Traité des Maladies Chir.* tom. iv. p. 274.

bone presents itself to the more contracted aperture between them. In some dislocations of the foregoing kind, which have come under Mr. Hey's management subsequently to the publication of his first edition, he has succeeded in reducing the bone by pressure without extension. The pressure should be made against the luxated extremity of the first phalanx, which, in these cases, lies upon the back part of the metacarpal bone. *

In one instance, where a dislocation of the first phalanx of the thumb backwards from the metacarpal bone had continued about twelve days, and could not be reduced, Desault recommended the patient to let an incision be made behind the extremity of the luxated bone of the thumb, and a spatula, or some other lever, be introduced for the purpose of effecting the reduction. This suggestion, however, was not adopted. Mr. Evans, of Ketley, near Wellington in Shropshire, met with two cases of dislocation of the metacarpal bone towards the palm of the hand, and, in both these examples, the reduction could not be performed with extension, notwithstanding repeated trials were made. Mr. Evans was therefore induced to cut down upon the end of the bone, thrust it out of the wound, and saw it off. In both cases, the reduction was then effected with the greatest facility. The wound was immediately closed, the parts united favourably, and nearly the perfect use of the thumbs was recovered. †

Instead of the preceding method of treatment, were I to meet with a case, which could not be reduced in the manner advised by Mr. Hey, I should prefer following Mr. Charles Bell's suggestion, which is to insinuate a couching needle obliquely under the skin, and divide with it one of the lateral ligaments, the main difficulty to reduction no doubt arising from their embracing the head of the bone. ‡

Although I conceive, that extension made precisely in the line of the axis of the two phalanges of the thumb must tend to lock the head of the first phalanx still more firmly, it appears to me, that, if it were made so as to incline the latter bone towards the palm of the hand, it might contribute to facilitate the effect of direct pressure on the head of the displaced phalanx. Thus, Professor Boyer, after injudiciously recommending straight extension, finishes his advice with a more useful piece of instruction; "As soon as the surgeon

* Hey's Practical Observations in Surgery, p. 327—329. edit. 2.

† Ibid. p. 330.

‡ Operative Surgery, vol. ii. p. 261.

perceives, that the dislocated phalanx yields to the extending force, he is to press upon the base of the phalanx with both his thumbs, and push it forwards and downwards, while the assistant, who makes the extension, inclines this phalanx into the bent position." *

My friend, Mr. Carwardine, met with a case of compound luxation of the anterior head of the first phalanx of the thumb, the posterior head of the second phalanx was left resting upon the back of the first phalanx, while the extremity of the thumb stood upright. After repeated fruitless attempts at reduction by means of extension, Mr. Carwardine succeeded by pushing forwards that extremity of the second phalanx, which rested upon the first, until he had brought the articulating surfaces into contact. He then turned the second phalanx round the projecting extremity of the first, and easily accomplished the reduction. †

DISLOCATIONS OF THE THIGH-BONE AT THE HIP.

These cases are much less frequent than fractures of the neck of the bone. When the surgeon adverts to the depth of the acetabulum, which is still further deepened by a cartilaginous border, — and when he remembers the thickness of the capsular ligament, the support derived from the ligamentum teres, and from the numerous strong muscles which surround the joint, he will see great obstacles to a luxation. In fact, such is the strength of the articulation, that the head of the femur cannot be displaced, unless the force applied be very considerable, and other circumstances of an unusual nature concur in the production of the accident.

Dislocations of the thigh-bone at the hip-joint are of four kinds. In the first, the head of the bone is thrown upon the obturator foramen; in the second, into the upper part of the groin upon the os pubis; in the third, upon the dorsum of the ilium; and, in the fourth, upon the sacro-ischiatic notch.

Whatever may be the point of the brim of the acetabulum, over which the head of the bone escapes from that cavity, the displacement can never happen without producing a laceration of the capsular ligament.‡ In the dislocation upon the

* Boyer, *Traité des Maladies Chir.* t. iv. p. 274.

† See Hey's *Practical Observations*, p. 331.

‡ This statement, with respect to all common cases, I believe to be correct: but there are certain cases, which form exceptions. Thus, luxations without laceration of ligaments may arise from paralysis of such muscles as naturally serve to strengthen a joint, as we find exemplified in

obturator foramen, the ligamentum teres may not be ruptured *; but, in other examples, it is almost invariably lacerated †; and it is even sometimes broken in the luxation upon the obturator foramen, as is put out of all doubt by a preparation in the Collection at St. Thomas's hospital. Indeed, Mr. A. Cooper states in general terms, that, in the latter case, the ligamentum teres is torn through ‡: but, if we are to credit Boyer, this can only happen when the head of the bone is very extensively displaced. §

One of the most frequent luxations of the thigh is that, in which the head of the bone is thrown upon the obturator foramen, viz. downwards and forwards. Flajani ||, Callisen ¶, and many other distinguished surgeons, regard the dislocation in this direction as the most common. Every anatomical reflection would also lead to an expectation of this opinion being correct. Doubts of its accuracy, however, must be

two cases recorded by Mr. A. Cooper. (Surgical Essays, Part ii. p. 10.) Another modern writer also remarks: "From the extent of relaxation, that I have sometimes observed in the ligaments of the large joints, there seems to be ground for believing, that complete, as well as incomplete luxation, may in some cases occur at the shoulder, without laceration of the capsule, particularly as there is demonstrative evidence of its occasionally taking place in the hip-joint." See Practical Observations in Surgery and Anatomy, by John Howship, p. 464. 8vo. Lond. 1816.

* Boyer, *Traité des Maladies Chir.* t. iv. p. 280. I infer that the latter part of the following statement must be a mistake: "The round ligament has a tendency to prevent dislocations in all directions, but particularly the dislocation downwards." A. Cooper's Surgical Essays, Part i. p. 26.

† The description given by Mr. Howship of some preparations in Mr. Heaviside's museum, does not appear to me to warrant the inference, that, in these particular cases, which were all of them unreduced dislocations upward and backward, the ligamentum teres had not been ruptured. This conclusion can hardly be admitted from a mere view of the dried bones, unaccompanied with that ligament. Neither does the account, which Mr. Howship has given of another preparation in the same collection, amount in my mind to a satisfactory proof, that, in the luxation of the thigh-bone there alluded to, the fabric of the joint was entire in respect to the ligaments. Nor would any thing, which this gentleman has said, incline me to adopt the sentiment, that the large ball and socket joints are liable to incomplete dislocations. However, lest what I now say may be incorrect, I should wish the candid reader to consult Mr. Howship's work, "Practical Observations in Surgery and Morbid Anatomy," p. 465—478, &c. Delpech, in his recent account of surgery, makes mention of some rare examples, in which the ligamentum teres was not torn in the luxation upwards and backwards, and of other uncommon instances, in which it was ruptured in the dislocation upon the obturator foramen. See *Précis des Maladies réputées Chirurgicales*, t. iii. p. 110.

‡ Surgical Essays, Part i. p. 37.

§ Vol. cit. p. 283.

|| Collezione d'Osservazioni e Riflessioni di Chirurgia, t. i. p. 62.

¶ *Systema Chirurgiæ Hodiernæ*, vol. ii. p. 585. 8vo. Hafniæ, 1800.

entertained; for, Professor Boyer assures us, that the dislocation upwards and backwards on the ilium, is as often met with as that downwards and forwards on the obturator foramen, and in his own practice has occurred with even greater frequency.* While Mr. Hey has seen only three luxations upon the obturator foramen, he has met with seven upwards and backwards.† It has not been my lot to see more than eight dislocations of the thigh, of which number only two were upon the obturator foramen. Mr. Astley Cooper, whose statements are generally founded upon ample experience, concurs with Boyer and Hey in representing the luxation on the dorsum of the ilium as the most frequent.‡

At all events, the dislocation on the obturator foramen is more common than any other case, except that which happens in the direction upwards and backwards; and its occurrence must be materially facilitated by the capsular ligament being weaker, and the brim of the acetabulum less raised, at the lower and inner part of the articulation, than at other points, while the ligamentum teres, being inserted near the notch in the acetabulum facing the obturator foramen, will allow the head of the thigh-bone to descend a certain way downwards and forwards without being ruptured, or making any considerable resistance.

The following are the symptoms of a dislocation upon the obturator foramen: a hard tumour, caused by the lodgment of the head of the thigh-bone upon the obturator externus muscle and obturator ligament, may be felt at the inner and upper part of the thigh towards the perineum. The limb appears three or four inches longer, than natural§; and, according to the reports of the generality of surgical writers, the toes and knees are turned outwards||; an effect, which is ascribed to the tension and elongation of the muscles concerned in rotating the limb in this direction. There appears, however, to be no regularity attending the position of the toes. In the cases which fell under the notice of Mr. Hey, the foot of the affected limb was not turned outwards.¶ The

* *Traité des Maladies Chir.* t. iv. p. 280.

† *Hey's Practical Observations in Surgery*, p. 314. ed. 2.

‡ *Surgical Essays*, Part i. p. 27.

§ *Hey's Practical Observations in Surgery*, p. 321. ed. 2.

|| Flajani, *Collezione d'Osservazioni e Riflessioni di Chirurgia*, t. i. p. 64; Boyer, *Traité des Maladies Chirurgicales*, t. v. p. 285; C. Bell, *Operative Surgery*, vol. ii. p. 275, &c.

¶ A degree of ambiguity is thrown upon Mr. Hey's statement, by his adding "with respect to the knee;" but, as the toes can never be turned

foot, says Mr. A. Cooper, though it is widely separated from the other, is generally neither turned outwards, nor inwards, although he has seen it varying a little in this respect in different instances: he thinks, therefore, that the position of the foot does not mark the accident, the diagnostic symptoms being the bent position of the body, the separated knees, and the increased length of the limb.*

While the knee and foot of the luxated limb are widely separated from the other member, the upper part of the affected thigh is nearer to the opposite thigh than natural, and the trochanter major less prominent. The glutæi muscles are drawn downwards, put upon the stretch, and considerably flattened. The pyriformes are at the same time elongated and tense. Hence, the reason why the limb is widely drawn away from its fellow, and cannot be put near it without great difficulty. The triceps is also in a state of considerable tension, forming a hard mass, which reaches from the os pubis to below the middle of the thigh. The bent position of the body, specified by Mr. A. Cooper as one of the most constant symptoms, is owing to the tension of the psoas and iliacus internus muscles. When the case is examined, as the patient stands up, the thigh seems evidently more forward, than usual. It is alleged by J. L. Petit, that, when a dislocation upon the obturator foramen is not immediately reduced, the pressure of the head of the bone upon the anterior crural nerve and femoral vessels gives rise to numbness and swelling of the whole limb. Boyer has never seen these consequences happen, the reduction having always been performed without delay in every instance that has fallen under his notice; nor has he ever witnessed either the swelling of the scrotum, alleged by some writers to be a common effect of this dislocation, or the retention of urine, said by Hippocrates to be a frequent consequence of the accident.†

I have already noticed, that one would be led by a consideration of anatomical circumstances to expect, that the dislocation upon the obturator foramen must be the most frequent luxation, to which the thigh is liable. This opinion, however, is not confirmed by experience, and the reason is explicable by the fact, that a dislocation in this direction can happen only when the femur is forcibly separated from the opposite

out with respect to the knee, in a mere dislocation of the hip, I conclude, that the expression has been inadvertently employed.

* Surgical Essays, Part i. p. 37.

† Vol. cit. p. 287.

limb, and in falls, the thighs are rarely drawn far away from each other.

Whether the foot be found somewhat inclined outward, or not, in the dislocation upon the obturator foramen, the case cannot be mistaken for a fracture of the neck of the thigh-bone, because this last accident is never attended with any elongation of the limb, but almost always with a manifest shortening of it.

The dislocation of the head of the thigh-bone forwards and upwards upon the os pubis, is considered by Mr. A. Cooper as more easy of detection, than any other luxation of the thigh. The limb is an inch shorter than the other; the knee and foot are turned outwards; and cannot be rotated inwards. According to the same gentleman, however, there is a slight flexion forwards and outwards, and in one instance, which had been long unreduced, the motion at the knee backwards and forwards was full twelve inches. The striking criterion of the case is the facility, with which the head of the thigh-bone may be distinctly felt upon the pubes, above the level of Poupart's ligament, and on the outer side of the femoral artery and vein.*

The luxation forwards and upwards upon the pubes cannot so easily take place, as the dislocation upwards and backwards, or that downwards and forwards. It is not, however, very uncommon, Boyer † has met with three examples in his own practice; and several others are cited by Mr. Astley Cooper. In this kind of dislocation, the head of the thigh-bone rests upon the horizontal ramus of the os pubis, and, in old unreduced cases, dissections prove, that it even tears up Poupart's ligament so as to get between it and the last mentioned bone, occupying a situation also between the sheath of the crural vessels and the anterior inferior spinous process of the ilium.‡ According to Boyer, when the displacement is recent, the head of the os femoris lies between the os pubis, and the mass common to the psoas and iliacus internus muscles, which is raised up by it. The upper portion of the capsular ligament and the ligamentum teres are lacerated.§ The glutæi, pyramidalis, gemelli, obturatores, and quadratus, are tense and elongated, while all the other muscles about the joint are relaxed. Boyer says, the femoral vessels

* A. Cooper, Surgical Essays, Part i. p. 45.

† Traité des Maladies Chir. t. iv. p. 286.

‡ A. Cooper, Surgical Essays, Part i. p. 46.

§ Also, A. Cooper, ib.

and anterior crural nerve are pushed inwards, and perhaps at the same time lifted up by the head of the bone; but, as this state of parts is not specified in the account given by Mr. A. Cooper of a case dissected and preserved in the museum at St. Thomas's hospital, this part of Boyer's description needs confirmation. He allows, however, that the compression of the vessels and nerves is never powerful enough to cause a risk of gangrene, when the reduction is delayed; a truth well proved by the three unreduced cases which fell under the notice of Mr. Astley Cooper.*

This last species of dislocation is mostly occasioned by some violent effort, by which the os femoris is forced backwards, and the pelvis forwards. The observations of the latter experienced surgeon prove also, that the head of the thigh-bone may be thrown forwards upon the pubes, when a person puts his foot into some unexpected hollow in the ground, and his body at the moment is bent backwards.

As already remarked, the most frequent dislocation of the head of the thigh-bone is upwards and backwards upon the dorsum of the ilium, under the glutæus minimus. According to Mr. Astley Cooper, the limb is from one inch and a half to two inches and a half shorter than the other, as may be easily seen by comparing the malleoli interni. On the dislocated side, the toe rests against the tarsus of the other foot. The knee and foot are turned inwards, and the knee is a little advanced upon the other; the latter effect arising from the tense state of the triceps and gracilis. When an attempt is made to separate the dislocated from the sound limb, it is found to be firmly fixed in its new situation, with respect to any movement, or rotation outwards, but the thigh can be slightly bent across the other.† The constant rotation of the member inwards is, I believe, correctly ascribed by surgical writers to the circumstance of the lower and inner portion of the capsular ligament remaining entire, and keeping the fore-part of the trochanter major close to the ‡ acetabulum. Unless much blood be effused under the skin §, the head of the bone can be felt moving upon the dorsum of the ilium, when the knee is rotated inwards, and the trochanter major is perceived to be much nearer to the spinous process of the ilium, and is less prominent, than natural.

* Surgical Essays, Part i. p. 45.

† Ibid. p. 27.

‡ Delpsch, Précis Elementaire des Maladies Chir. tom. iii. p. 112.

§ A. Cooper, Surgical Essays, Part i. p. 27.

The marks of distinction between this case and a fracture of the neck of the thigh-bone have been very correctly specified in Mr. Astley Cooper's late publication. In a fracture of the neck of the thigh-bone, the knee and foot are generally turned outwards; the trochanter is drawn backwards; and the limb can be readily bent towards the abdomen, although with some pain. But, what most particularly merits attention, is that the limb, which is shortened from one to two inches by the contraction of the muscles, can be made of the length of the other by a slight extension, and, when the extension is discontinued, the leg is again shortened. When the limb is extended and rotated, the surgeon may also feel a crepitus, which cannot be perceived while the limb is moved in the shortened position.* However, as many of these and other circumstances have been already touched upon in speaking of fractures of the neck of the thigh-bone, it will not be necessary to detain the reader longer on the characteristic signs of these last accidents.

A dislocation of the os femoris downwards and backwards must be exceedingly rare, if it occur at all; for, it appears from the statement of Mr. Astley Cooper, that no case of this kind has occurred in his own private practice, or at St. Thomas's or Guy's hospital, during the last thirty years; and hence, he is inclined to doubt the possibility of the accident.† He remarks, that the dislocation on the ischiatic notch has been incorrectly described by writers, all of whom, as far as he knows, represent the limb as being lengthened. The error, he says, must have arisen from their having examined the pelvis separated from the skeleton, and seen that the ischiatic notch was below the level of the acetabulum, when the pelvis was horizontal; but, he observes, that, in the natural oblique position of the pelvis, the notch in question is above the acetabulum, at least, as regards the horizontal axis of the two cavities.‡ What Boyer says about luxations downwards and backwards so far concurs with the observations of Mr. Astley Cooper, that primitive dislocations in this direction are represented as in all probability never taking place; because they could not happen, unless at the moment of the accident the thigh were bent and carried inwards further than the resistance of the trunk and opposite member would allow. However, the Baron is of opinion, that such displacement of the head of the thigh-bone

* A. Cooper, Surgical Essays, Part i. p. 28.

† Ibid. p. 27.

‡ Op. cit. Part ii. p. 13.

may occur consecutively, and follow the luxation upwards and outwards, when the thigh by any cause is put, after this accident, in a state of flexion and adduction. Under these circumstances, Boyer thinks it possible for the head of the bone to slip downwards in front of the upper part of the ischiatic notch*; but, that it can never glide down as low as the junction of the ilium with the ischium, much less below this point. I shall conclude these few observations on the cases improperly termed luxations *downward* and backward, with expressing my opinion, that the profession are much indebted to Mr. Astley Cooper for his explanation of the error, which has prevailed on the subject, because the false supposition that the head of the thigh-bone is ever displaced *downward* and backward, and the limb lengthened, may occasion serious mistakes in judging of the nature of the accident.

With regard to the prognosis in luxations of the thigh, it embraces the consideration of the bad symptoms which may originate from the injury; the difficulty of reduction; and the consequences, when the head of the bone is left unreduced. In reflecting upon the strength of the hip-joint, and the number and force of the surrounding muscles, one might be led to suppose, that the head of the os femoris could not be displaced from the acetabulum, without great mischief being done to the soft parts, followed by severe symptoms. In this respect, however, experience proves, that dislocations of the femur are not attended with more danger, than those of the shoulder. After the reduction, the pain and swelling generally soon subside; and, in about eight or ten days, the patient is sometimes able to walk again.† But, though the generality of cases are not followed by such inflammation, as occasions any important consequences, we learn from a valuable modern work, that, in a few unusual instances, suppuration takes place after the reduction, and the patient dies.‡ Even when the case is not reduced, the pain and swelling commonly soon go off, and the limb gradually regains as much power of motion, as the circumstances of the displacement will allow.

The reduction of luxations of the thigh-bone at the hip is attended with more difficulty, than that of the generality of dislocations. The distance, to which the head of the femur is re-

* Of course, according to Mr. Astley Cooper's account, this case cannot strictly be called a dislocation *downward* and backward, because in the natural position of the pelvis, the level of the ischiatic notch is rather higher, than that of the acetabulum.

† Boyer, *Traité des Maladies Chir.* tom. iv. p. 290.

‡ A. Cooper's *Surgical Essays*, Part i. p. 5.

moved from the acetabulum, and the large number and strength of the muscles, almost constantly make the business of reduction troublesome. The degree of difficulty, however, varies in different cases and different individuals. In thin, weak, delicate persons, the head of the bone can be replaced with much less trouble, than in strong athletic subjects, whose muscles are capable of making vast resistance. The dislocation downwards and inwards, and that upwards and inwards upon the horizontal branch of the os pubis, are generally more easy of reduction, than the case upwards and backwards.

Recent luxations at the hip are more easy to reduce, than such as have existed some time, many of which indeed are quite irreducible. A question here arises, what is the period, at which an attempt at reduction becomes useless, and all chance of success is at an end? This is a question, to which, in the present state of surgical knowledge, an exact answer cannot be given. The records of surgery furnish one extraordinary instance, in which a luxation at the hip was successfully reduced, after it had continued two years, the nature of the accident not having been previously made out. * I believe the attempt at reduction will hardly even succeed after three months. Two cases of late reduction are mentioned by Mr. Astley Cooper: in one, Mr. Bennett of Chester replaced the head of the femur, after it had been on the dorsum ilii two months, the object having been materially promoted by the effects of opium, bleeding, and nauseating doses of the tartrate of antimony. The reduction, however, was followed by an inflammation of the hip, of which affection the patient had not recovered, at the time when Mr. Bennett communicated the particulars to Mr. A. Cooper. The other example of late reduction was sent to the Medical and Chirurgical Society by Mr. Tripe, surgeon at Plymouth: the bone had been out of its place seven weeks. † The period, when all chance of success ceases, probably varies in different individuals; for, in one case related by Mr. A. Cooper, every attempt at reduction was found unavailing after five weeks. ‡

Leaving a dislocation of the thigh permanently unreduced

* See Guyenot, *Mémoire sur les anciennes Luxations*; *Mémoires de l'Académie de Chirurgie*, tom. v. 4to. After a careful perusal of the case, here adverted to, I am disposed to think, that the particulars given by the author make out an example of diseased hip-joint where the event was favourable, rather than the reduction of a luxation of the head of the thigh-bone at the end of two years.

† A. Cooper, *Surgical Essays*, Part ii. p. 17, 18.

‡ Op. cit. Part i. p. 25.

is a mistake of the most serious nature, as the patient is rendered a cripple for life. An unreduced dislocation of the femur, however, does not make the patient for ever afterwards absolutely incapable of standing, or walking, though it disqualifies him from doing so with any degree of ease. Nothing can be more interesting to the philosophical surgeon, than the observation of the efforts, which nature is constantly making for the reparation of injuries affecting the human body, and, perhaps, if there are any examples, which more strikingly than others illustrate such efforts, I believe they are to be found in cases of unreduced dislocations of the hip. Here the changes, wrought by the hand of nature, are truly surprising, a new socket being gradually constructed * for the displaced head of the bone, and the patient recovering the power of standing and walking at first upon crutches, and at length with a stick, or even without any such assistance. †

With a view of promoting the reduction of the dislocation upwards and backwards, Mr. A. Cooper recommends taking from the patient from twelve to twenty ounces of blood, or even more, if a very strong man; and then placing him in a warm bath at the temperature of 100°, and gradually increasing the heat of the water, until he begins to be faint. While he is in the water, he is also to be given a grain of tartarized antimony every ten minutes, until nausea is excited, when he is to be removed from the bath ‡, put between blankets, and placed on a firm table, or a mattress on the floor, in order to have the displaced bone put back into its socket. There can be no doubt, that the means here advised will facilitate the reduction. The bleeding in particular seems quite proper as a general practice, because it may have an additional good effect in preventing subsequent inflammation of the soft parts about the injured hip; and I think

* "The new cup, which is thus formed, sometimes so completely surrounds the neck of the bone, as to prevent its being removed from it without fracture." A. Cooper, *Surgical Essays*, Part i. p. 7.

† The limits of this work prevent me from entering into a particular description of the changes, which happen when dislocations of the femur are left unreduced; but, I feel pleasure in referring to some modern publications, in which the subject is considered; Boyer's *Traité des Maladies Chir.* t. iv. p. 294., &c. 8vo. Paris, 1814; Sandifort's *Museum Anatomicum*, vol. i. fol. Lugd. 1793; A. Cooper, *Surgical Essays*, Part i.; Howship's *Practical Observations in Surgery and Morbid Anatomy*, 8vo. Lond. 1816.

‡ A. Cooper, *Surgical Essays*, Part i. p. 30. This employment of venesection, the warm bath, and emetics, was also many years ago particularly recommended by Loder. (See *Chir. Med. Beobachtungen*, 1. b. p. 170. 8vo. Weimar, 1794.)

therefore that it should only be dispensed with in persons, whose constitutions are not in a state to bear the loss of blood without serious detriment. But, with regard to the warm bath and nauseating doses of tartrite of antimony, proper as they are in cases of difficulty, it may be questionable, whether they ought always to be put in practice before any attempts at reduction are made, because the bone may frequently be replaced with moderate trouble, and then some delay and annoyance will be avoided. However, when the first endeavours of the surgeon do not succeed, no doubt can exist about the propriety of trying to debilitate the patient not only by bleeding, but also by the warm bath, and nauseating doses of tartrite of antimony. Also, whenever the bone has been some days, or weeks, out of its place, more trouble than usual is to be expected, and, therefore, under such circumstances, I should conceive that it would always be right to take every possible means of incapacitating the muscles by bringing on a temporary prostration of strength. In common instances, as I have already said, I should be content with bleeding the patient, and then proceed without further loss of time to the reduction.

For the purpose of accomplishing this object, in cases of dislocation upwards and backwards, the surgeon is to direct the patient to be laid on his back upon a large firm table, strong four-posted bed, or the floor, with a mattress, or blanket, under him. The pelvis must be fixed by proper means, or, what amounts to the same thing, counter-extension equal to the extending force must be performed by the assistants. These last very necessary proceedings are fulfilled by means of a sheet, which is to be folded longitudinally, its middle being applied between the pudenda and the thigh, and its two ends being either fastened to some immovable point, generally to the bed-post, or leg of the table on the opposite side, behind the patient's head, or given into the hands of the assistants who are to make the counter-extension. This is the method usually selected in this country. But the French, to whom I think we must concede the merit of paying the strictest attention to the right indications in the treatment of simple fractures and dislocations, follow a different plan. They fix the pelvis, or make the counter-extension, by placing the middle of the sheet between the pudenda and the upper inner part of the sound limb, taking care to interpose some soft materials, in order to prevent the ill effects of pressure. One end of this sheet is carried over the groin, and the other over the buttock, and, where they both meet over the crista of the ilium, they are twisted together, and then given into the hands of the assistants. The evident advan-

tage of thus applying the sheet for fixing the pelvis, or making the counter-extension, is that its ends are more out of the surgeon's way, and cannot slip, so as to form any hindrance to the reduction. When the counter-extending sheet, or girt, is applied in this manner, however, it is so far out of the line of extension, that, unless another contrivance be also adopted, the side of the pelvis, on which the dislocated bone is situated, would be drawn downwards by the extending force. The second contrivance here alluded to, is another sheet, or table-cloth, folded longitudinally, or any broad strap, or girt, the middle of which is to be applied just below the crista of the ilium on the injured side, and the ends carried round to the opposite side of the pelvis just above the crista of the ilium, where they are to be twisted together, and then put into the hands of one or two of the assistants, whose duty it is to draw them at the time of the reduction in the direction in which they have been placed. I believe, unless two sheets, or girts, be thus used for fixing the pelvis, the object can never be strictly answered, though often in a sufficient degree to enable the surgeon to effect the reduction. In all difficult cases, however, I conceive the best plan is to make the counter-extension perfect by employing one folded table-cloth, or band, for effectually hindering all yielding of the pelvis on the injured side.

The French surgeons apply the extending means just above the malleoli, and thus have the advantage of a very long lever, which, at a certain period of the extension, is sometimes of considerable utility in facilitating the inclination of the head of the bone in the most desirable direction. However, whether the extension be made thus low down, or, as is customary in England, just above the condyles of the femur, flannel, or some other substance should be interposed between the limb and the sheet, band, or strap, with which the extension is to be made, so that the part may not be chafed or injured by the pressure. For making the extension, Mr. Astley Cooper gives a preference to pullies, and, when the reduction is attended with difficulty, no one can doubt their advantage. I have frequently seen them employed in various cases of luxation, without any ill effects; but, it is certain, that, in unskilful hands, and when made to act with unnecessarily sudden and immoderate violence, they may cause serious mischief.

The following are the principal directions, which the preceding surgeon gives, with respect to the mode of reducing the dislocation upwards and backwards. The patient may be placed between two strong posts, about ten feet from each

other, in which two staples are fixed; or rings may be screwed into the floor, and the patient be placed upon it. If two convenient posts for the staples can be found, the patient is to be put upon his back on an intermediate table, over which a thick blanket¹ is spread. Then a strong girt is to be passed between his pudendum and thigh, and fixed to the staple behind the patient's head. Just above the knee a wet liner-roller is then tightly applied, over which a leather strap is buckled, having two other straps with rings at right angles with the circular part. The knee is to be slightly bent, but not quite to a right angle, and brought across the other thigh a little above the knee.* The pulleys are then to be attached to the other staple, and to the strap above the knee. The surgeon is now slightly to draw the cord of the pulley, and when he sees that every part of the bandage is upon the stretch, and the patient begins to complain, he is to wait a little, and allow the muscles to become fatigued. He is then to draw again, and, having thus increased the extension a little more, he is not to pull the cord further, but wait a short time again, in order to let the muscles yield. He is to proceed in this gentle and gradual manner, until the head of the bone is felt descending. When it reaches the edge of the acetabulum, he is to desire an assistant to take hold of the cord of the pulley, and keep up exactly the same degree of extension, while he himself is now to rotate the knee and foot gently outwards, and, as this is done, the bone slips into its place. In the foregoing method, the return of the head of the bone into the acetabulum does not generally cause any noise, the muscles being too much fatigued to produce this effect. When there is difficulty in getting the head of the femur over the brim of the acetabulum, the former is to be lifted up by placing the arm under it near the joint.†

The dislocation upwards and backwards cannot be conveniently reduced, while the patient lies upon the opposite side, because this position interferes with the extension made across the other limb.

When the thigh-bone is dislocated forwards and downwards upon the obturator foramen, the reduction may be performed while the patient lies either upon his back, or his sound side, and one chief object is to make a lever of the bone

* In reducing a luxation upwards and backwards, Boyer says "L'extension sera faite obliquement de dehors en dedans, et un peu de derriere en devant." Tom. iv. p. 301.

† A. Cooper, Surgical Essays, Part i. p. 51.

itself. For this purpose, a sheet or table-cloth longitudinally folded is placed under the bone a little way below the trochanters, which sheet being properly drawn towards the outside of the limb by an assistant, after due extension has been made, serves as a fulcrum, on which the head of the bone may be moved into the acetabulum. In order to accomplish this business, sufficient extension is to be made with the thigh at a right angle, or inclined somewhat less than a right angle to the trunk of the body *; then, while an assistant draws towards the hip the sheet placed a little below the trochanters, the surgeon is to make a lever of the bone by moving the condyles of the bone towards the other knee, or the ankle of the dislocated limb towards the other foot.

In general nothing can be more simple and easy, than the reduction of a dislocation upon the obturator foramen. If the case be recent, the head of the bone may sometimes be replaced, as Mr. A. Cooper has explained, by merely putting the patient in the recumbent posture, separating the thighs as widely as possible, and fixing the pelvis with a girt between the scrotum and upper part of the thigh, which things being done, the head of the bone will slip into its socket, if the surgeon now move the ankle of the dislocated limb over the opposite leg. "In this case, the patient might have the thigh fixed by the bed-post †, received between the pudendum and the upper part of the limb, and the leg be carried inwards across the other. But, in general, it is required to fix the pelvis by a girt passed around it, and crossed under that which passes around the thigh, otherwise the pelvis moves in the same direction with the head of the bone." ‡ And, in those cases, in which the dislocation has existed for three or four weeks, Mr. A. Cooper thinks it best to place the patient on the opposite side, fix the pelvis, and make a lever of the bone, much in the same way as I have already described. "Great care (he says) must be taken not to advance the leg in any considerable degree, otherwise the head of the thigh-bone will be forced behind the acetabulum into the ischiatic notch, from whence it cannot be afterwards introduced."

* Hey's Practical Observations in Surgery, p. 319. ed. 2. According to Boyer, the extension is here to be made obliquely from within outwards. The head of the thigh-bone being already lower than the acetabulum, it is plain, that extension made in a line corresponding to the axis of the body must tend to increase the displacement.

† As practised by the late Mr. Hey. See his Practical Observations in Surgery, p. 321. ed. 2.

‡ Surgical Essays, Part i. p. 39.

With respect to the dislocation upwards' and inwards upon the os pubis, it is generally found to be very easy of reduction. According to Professor Boyer, the extension should be made in a direction nearly parallel to the axis of the trunk, as the direction of the dislocated limb itself is but little changed. Mr. Astley Cooper recommends the patient to be laid upon his side on a table, and a girt, which is to be applied between the pudendum and inner part of the thigh, is to be fixed to a staple, a little before the line of the body. The pullies are to be fixed just above the knee, as in the dislocation upwards, and the extension is to be made in a line behind the axis of the trunk, the thigh-bone being drawn backwards. The extension having been continued for some time, an assistant is now to press on the pelvis, while with a napkin, laid under the upper part of the thigh, the head of the femur is to be lifted over the pubes and edge of the acetabulum.*

If what is termed a dislocation downwards and backwards ever occur, it must be very uncommon; and, in proof of the truth of this observation, it will be enough to mention, that Mr. Astley Cooper has never seen such an accident during the space of thirty years, either in hospital, or private practice. He conceives, also, that, in the description of this kind of luxation usually delivered, an anatomical error prevails, the head of the bone being represented to be yet in the ischiatic notch, though displaced downwards and backwards. In the natural position of the pelvis, this notch appears to this eminent practitioner to be above the level of a line drawn through the middle of the acetabulum, and hence, when the head of the bone is in the ischiatic notch, the leg is actually shortened, instead of being lengthened.†

I have already stated Boyer's opinion, that a real dislocation downwards and backwards probably never happens, except consecutively, or after a primitive dislocation upwards and backwards. He conceives, that, were such a case to present itself, the limb might be either elongated, shortened, or remain of its natural length, according to the position of the head of the femur with respect to the level of the ‡ acetabulum. But, even were this statement correct, the inconsistency of calling more than the first of these examples a luxation *downwards* and backwards would be quite manifest.

* A. Cooper, in Surgical Essays, Part i. p. 46.

† Ibid. p. 44.

‡ Traité des Maladies Chirurgicales, t. iv. p. 288.

DISLOCATIONS OF THE PATELLA.

The generality of writers on surgery speak of luxations of the knee-pan in four directions, viz. upwards, downwards, outwards, and inwards. But, as Boyer has observed, in the first two examples, the displacement of the bone is merely a consequence of another accident, namely, the rupture either of the tendon of the extensor muscles of the leg, or of the *ligamentum patellæ*. * According to many authors †, a dislocation of the patella inwards happens more readily, than that outwards. Mr. C. Bell ‡ says, this bone is most frequently displaced inwards, owing to the lesser degree of elevation of the inner condyle. Before the publication of the early editions both of the Dictionary and of this work, I had seen several cases of dislocation of the patella outwards, but never a displacement inwards, and I had therefore no hesitation in believing with some eminent modern surgeons, that the first case is by far the most frequent. The difference of my account from that given by Mr. C. Bell, however, has attracted the notice of Mr. Dunn, of Scarborough, who remarks, in a letter written to me some time back, that “on examining the bone (the femur) I should have been led to form your conclusion, owing to the greater magnitude of the inner condyle; but, on looking at the anterior and articular surface of the femur, I find, that the elevation is certainly less, and as such, I should conjecture, displacement inwards would be more easily produced.” The anatomical fact, the lesser elevation of the inner condyle, indeed, is the circumstance, which has led writers into a mistake on this point. The opinion, founded on this consideration, Boyer observes, is refuted by experience, which proves the greater frequency of the dislocation outwards; and no doubt, says he, this is owing to the inner edge of the patella projecting more than the external, so as to pass considerably beyond the articular pulley of the femur, and, consequently, be more exposed to such force, as is calculated to

* Writers also speak of cases, in which the patella is placed with one of its edges perpendicularly in the articular pulley of the femur, though there is some difficulty in conceiving, how the tendon of the extensor muscles of the leg, and the *ligamentum patellæ* can yield sufficiently to allow this rotation of the bone, much less that in which its front surface is turned completely backwards. Boyer, t. iv. p. 350.

† “*Patella interdum in interiorem, rarius in exteriorem partem ab injuria quadam externa e sede naturali propelli potest.*” Callisen, *Systema Chir. Hodiernæ*, vol. ii. p. 592. 8vo. Hafniæ, 1800.

‡ *Operative Surgery*, vol. ii. p. 279.

propel it outwards. * The ample experience of Mr. Astley Cooper also confirms the fact of the greater frequency of the displacement of the patella outwards, though his description of the mode, in which the accident is usually produced, is different from that of some other eminent surgeons: he observes, that the most frequent cause of the accident is from a person, in walking, or running, falling with the knee turned inwards, when the action of the muscles in the effort to prevent the fall draws the patella over the external condyle of the os femoris. The displacement, he adds, generally occurs in persons, who have some inclination of the knees inwards, which deformity disposes the patella to slip outwards during the action of the extensor muscles of the leg. † According to Boyer, both the dislocation outwards and that inwards are mostly caused by some external force, which propels the knee-pan in one of these directions; but, says he, great relaxation of the ligamentum patellæ, and a particular conformation of the condyles of the femur, may cause such a disposition to the accident, that the bone may slip out of its situation, without any outward force, from the mere contraction of the muscles. A girl came to Mr. Astley Cooper's house, who had the power of throwing her patella off the condyles of the femur. Her knees were bent considerably inwards, and, when the rectus muscle acted upon the patella, this bone was drawn from its natural situation into a line with the tubercle of the tibia, and laid nearly flat upon the side of the external condyle of the thigh-bone. She had been brought up as a dancing ‡ girl. The same gentleman also details cases, in which the ligament of the patella was left so considerably relaxed, after an accumulation of fluid in the knee-joint, that the patella was subject to displacement from the simple action of the extensor muscles of the leg. §

When the knee is considerably bent, a luxation of the

* *Traité des Maladies Chir.* t. iv. p. 549.

† Astley Cooper, *Surgical Essays*, Part ii. p. 57. This gentleman, in the first part of his work, relates some cases of luxation outwards from relaxation of the ligamentum patellæ; but, has not specified any example of luxation inwards either in his first or second volume. The several instances reported by Valentin, Ravaton, Itard, and Boyer, were all outwards. I conclude, therefore, that the dislocation inwards is uncommon.

‡ Examples of a similar nature are mentioned by Itard (*Journ. de Méd. de MM. Corvisart, Leroux, &c.* t. i. p. 516.) and by Boyer. The latter author considers this tendency to spontaneous luxations of the patella outwards always owing to a defective shape of the articular surface, combined with a lax state of the ligamentum patellæ.

§ *Surgical Essays*, Part i. p. 8.

patella cannot happen, because then the tendon of the extensor muscles and the ligamentum patellæ, keep this bone too firmly lodged in the depression between the condyles of the femur for any displacement to happen from external violence. But, if the leg be extended, or the knee only slightly bent, the connections of the patella are relaxed, this bone becomes more prominent, and its mobility is so much increased, that it is liable to be displaced either outwards, or inwards, according to the direction of the striking force.*

In the dislocation outwards, which is the most common, Boyer differs from some other writers † in representing the displacement as seldom complete, because the force which is applied, is rarely great enough to push the bone entirely off the articular pulley of the femur. In this circumstance, says he, the patella does not remain, as might be imagined, in its natural transverse position; but its anterior surface is turned a little inwards, and its posterior surface in a similar degree outwards, its inner edge inclining backwards, and lodging in the articular pulley itself, while its outer edge is turned somewhat forward. ‡

The accident is attended with the following symptoms: the leg is extended, and cannot be bent without seriously increasing the pain, which the patient already suffers; the inner margin of the articular pulley, off which the patella has slipped, can be plainly felt under the skin; over the outer part of the same pulley, the patella itself forms a remarkable swelling, and the outer edge of this bone is quite perceptible. Were the luxation complete, the extended position of the leg, the depression in the natural situation of the bone, the facility of distinguishing the articular pulley, and the tumour caused by the luxated bone itself upon the side of the outer condyle, would leave no chance of mistaking the nature of the accident.

A dislocation inwards may happen, when an external force propels the outer edge of the patella in this direction; but, the case is hardly ever complete. § The patella forms a considerable prominence upon the internal condyle; its front surface

* Boyer, *Traité des Maladies Chir.* t. iv. p. 350.

† “La disposition des surfaces ne paraît pas très-favorable à cette espèce de déplacement; cependant l’observation démontre qu’elle est possible, mais elle a été vue rarement.” Delpech, *Précis Elem. des Mal. Chir.* t. iii. p. 124.

‡ Boyer, *Vol. cit.* p. 351.

§ “On n’a point observé un semblable déplacement de la rotule vers le côté interne du genou.” Delpech, *Vol. cit.* p. 126.

is inclined outwards, and its posterior one inwards; while its outer edge is turned backwards, and its inner one forwards. In the depression observable in the situation, from which the patella is removed, the outer condyle may be plainly felt with the finger. The leg is extended, and an attempt to bend the knee produces a great increase of pain. Were the luxation inwards complete, the case would be sufficiently manifest, by the depression in the natural place of the patella, and the extraordinary prominence occasioned in its new situation. *

Dislocations of the patella are not generally attended with risk of serious consequences, and when the extensor muscles of the leg are completely relaxed, and sufficient pressure is employed, the reduction is perfectly easy. † However, if the violence applied should have been very great, the injury done to the ligaments of the joint may be far more dangerous, than the mere displacement of the patella itself. Boyer says, that he has never known of any case, in which a dislocated patella was left unreduced, and, therefore, he cannot pretend to describe the exact state, in which the patient would be likely to be; though he conceives, that the flexion of the knee would be imperfect, and the joint weakened. Mr. Dunn, of Scarborough, to whom I feel indebted for several valuable communications, some time ago gave me an account "of a person at Pickering, who, from an oversight of the surgeon, has had a dislocation of the patella outwards for twenty years. The anterior part of the knee is soft, and filled with a fluid, (lately requiring blistering to keep it down.) The patella lies on the outside and back of the external condyle of the femur. When he walks, he has a short stick to assist him. The limb seems to be raised by the flexors alone. As his knee is slightly bent, he rests upon his toes, and performs a sort of skipping, or jerking motion. He cannot raise his leg while sitting."

From what has been already said, it is evident, that in some cases, merely extending the leg, without bending the

* Boyer, *Traité des Mal. Chir.* t. iv. p. 351.

† A Case, attended with some trouble, occurred in Mr. G. Young's practice, and is described by Mr. A. Cooper, *Surgical Essays*, Part ii. p. 58. An instance of similar difficulty is also recorded by Valentin. (See *Recherches Critiques sur la Chirurgie Moderne*.) The difficulty in both cases, however, only proceeded from the limb not being at first sufficiently elevated, and, as soon as the heel was raised up high enough to bend the thigh on the pelvis, as well as extend the leg, the patella was readily pushed back into its natural situation. Sabatier once appears to have failed to accomplish the reduction of a dislocation outwards, which Boyer afterwards rectified by attending to the perfect relaxation of the extensor muscles of the leg. See Boyer's *Traité des Maladies Chir.* t. iv. p. 359.

thigh at all on the pelvis, will not enable the surgeon to reduce a dislocated patella. Hence, the practice inculcated both by Boyer and Mr. A. Cooper, is the same as that particularly recommended by Valentin: the latter says, the patient should be placed in a recumbent posture, and an assistant is to raise the leg, by lifting it at the heel. The extensor muscles being thus fully relaxed, the surgeon is to press down that edge of the patella which is most remote from the joint, whether the luxation be outwards, or inwards. This pressure raises the inner edge of the bone over the condyle of the femur, and the patella is immediately drawn into its natural situation by the muscles. * The position of the limb advised by Boyer for the reduction is precisely the same as that recommended by Valentin and Mr. A. Cooper; but, with this addition, that a solid plane is laid under the limb in this state, in order to fix the knee at the period of pressing upon the patella. †

After the reduction, the joint should be covered with linen kept wet with a cold evaporating lotion; and other antiphlogistic means are to be employed. When the swelling abates, a bandage is to be applied. Should any disposition to relapse exist, in consequence of a relaxed state of the ligamentum patellæ, or the shape of the condyles of the femur, a laced knee-cap will be of service.

These are all the remarks, which I am prepared at present to offer on dislocations, in addition to what is contained in the Dictionary. A brief account of some interesting observations, lately published by Dupuytren, on luxations of the ankle, accompanied with fracture of the fibula, has already been delivered in the preceding chapter.

* A. Cooper, *Surgical Essays*, Part ii. p. 53.

† *Traité des Mal. Chir.* t. iv. p. 354.

EXPLANATION OF THE PLATES.

PLATE XII.

FIG. 2. Represents the peritoneum, freed from the integuments and muscles, extending on each side into the scrotum, and forming on the right a congenital hernia.

- a. a.* The layers of skin and muscles dissected and reflected.
- b. b. b.* The entire bag of the peritoneum detached from the muscles.
- c. c. c.* The abdominal viscera distinguishable through the peritoneum.
- d.* The production of peritoneum on the right side dilated by the bowels protruded from the abdomen, and forming the hernia.
- e.* The other production of peritoneum in the left groin.
- f.* The place, where the latter production was closed, which is partially inflated, in order that the state of the parts may be better seen.
- g. g.* The skin of the scrotum reflected.
- h.* The bottom of the scrotum.
- i.* The bladder situated in front of the bag of the peritoneum.
- k.* The commencement of the urachus.
- l.* The penis, without its integuments.
- m.* The prepuce.
- n. o. p.* The hernial sac, of different capacity at different points, extending to the bottom of the scrotum.
- q.* The ileum small intestine seen through the peritoneum.
- r.* The cæcum, also seen through the membranous sac.
- s.* The appendicula vermiformis.
- t.* The left testicle.

PLATE XIII.

FIG. 1. The peritoneum being opened, the contents of the abdomen and hernial sac are brought into view.

- a. a.* The integuments of the abdomen and scrotum, with the muscles reflected.
- b. b.* The layers of peritoneum reflected, shewing its very smooth internal surface.
- c. c. c. c.* The hernial sac.
- d. d.* The small intestines.
- e.* The end of the ileum.
- f.* The cæcum.
- g.* Colon.

h. The appendicula vermiformis, extending to the bottom of the scrotum, and adherent to the hernial sac.

i. The testicle.

k. The epididymis.

l. The spermatic vessels.

m. The vas deferens,

n. The bladder, drawn towards the left side, in order to let the contents of the hernial sac be better seen.

o. The penis.

FIG. 2. The hernial sac being laid open, and the intestines turned back, an adhesion of the appendicula vermiformis to the sac and testicle is seen.

a. a. a. The production of peritoneum, that formed the hernial sac.

b. The colon.

c. The cœcum.

d. The ileum.

e. The appendicula vermiformis.

f. The firmish apex of this appendix adherent to the sac and testicle.

g. The testicle.

i. The spermatic vessels.

h. The epididymis.

k. The vas deferens.

PLATE XIV.

FIG. 1. *a. a.* Portion of omentum contained in a congenital inguinal hernia.

b. The testicle.

c. The epididymis.

d. A part of the omentum changed into a cylindrical mass.

e. e. e. Appendices of the omentum.

f. f. Intimate adhesions of the omentum to the bottom of the hernial sac, which here consists of the tunica vaginalis testis.

FIG. 2. *a. a.* The cœcum.

b. b. b. Natural adhesions of the cœcum and beginning of the colon to the peritoneum, just as they existed in the right ileo-lumbar region before the formation of the hernia.

c. d. e. f. g. The hernial sac, composed of that portion of the peritoneum, which is naturally situated in the right ileo-lumbar region.

h. The end of the ileum.

i. The beginning of the colon.

k. One of the appendices of the colon.

l. The appendix vermiformis cœci.

m. n. Aponeurotic sheath of the cremaster, which covers the tunica vaginalis, opened at its lowermost part.

o. o. Integuments of the scrotum.

p. q. Dotted lines shewing the situation of the end of the ileum and of the beginning of the colon in the cavity of the abdomen.

r. The epigastric artery.

s. The epigastric vein.

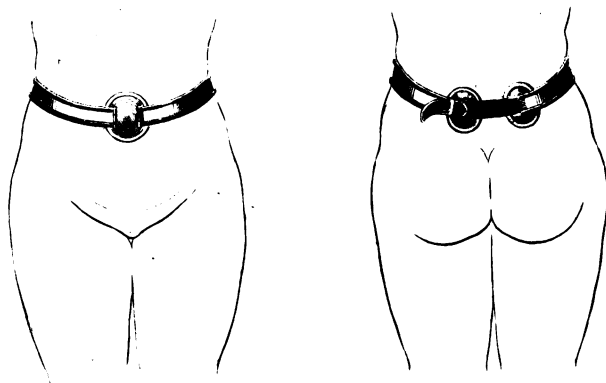


Fig 1.

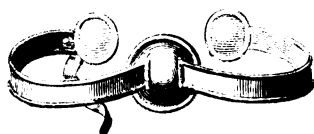
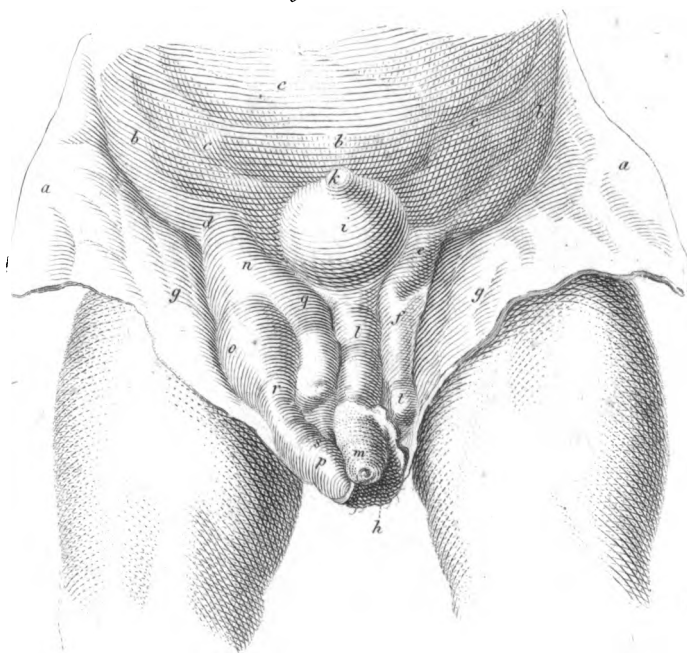


Fig 2



Milton sculp.

PLATE XV.

FIG. 1. *a. a.* Part of the cœcum contained in a hernia.

b. c. Natural adhesions of the cœcum and beginning of the colon to the peritoneum which belonged to the right ileo-lumbar region.

d. e. f. Appendix vermiformis.

g. h. i. Natural adhesions of the appendix vermiformis to the peritoneum forming the hernial sac.

k. The end of the ileum.

m. m. Dotted lines shewing the situation of the end of the ileum and of the beginning of the colon in the right ileo-lumbar region.

n. n. Aponeurosis of the external oblique muscle.

o. o. o. The hernial sac.

p. q. The tunica vaginalis laid open.

r. The testicle.

s. The epididymis.

t. The spermatic cord.

FIG. 2. *a. b.* A portion of the left colon, which, previously to its descent into the scrotum, had been fixed by the peritoneum in the ileo-lumbar region, a little way from the iliac vessels. This part of the left colon has been drawn away from the bottom of the hernial sac, and raised with hooks, in order that one may plainly see, that this bowel is united to the hernial sac by some folds of peritoneum, which naturally fixed it in the left ileo lumbar region.

c. c. c. Bands of the peritoneum connecting the left colon to the hernial sac.

d. The lateral ligament of the colon.

e. e. The hernial sac.

f. The neck of the hernial sac.

g. The cellular substance between the hernial sac and aponeurosis of the cremaster.

h. h. h. Aponeurosis of the cremaster.

i. i. The same aponeurosis, closely embracing the tunica vaginalis, opened at its lowest part.

k. k. The tunica vaginalis.

l. The testicle.

m. m. The integuments of the scrotum.

n. Part of the rectus muscle.

o. o. Aponeurosis of the external oblique muscle, near the left abdominal ring.

THE END.

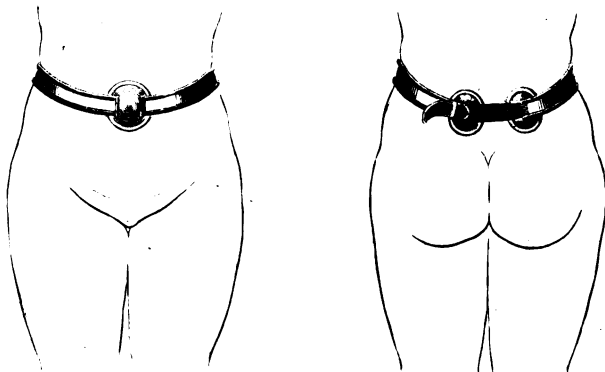


Fig 1.

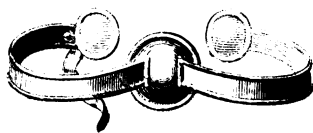
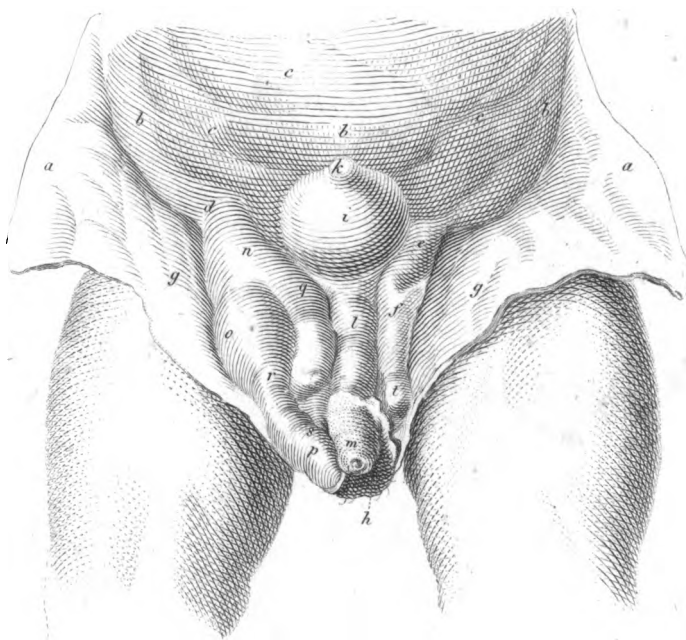


Fig 2



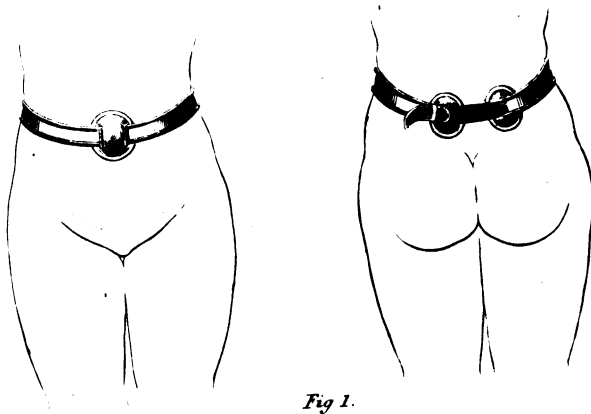


Fig 1.

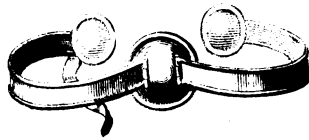
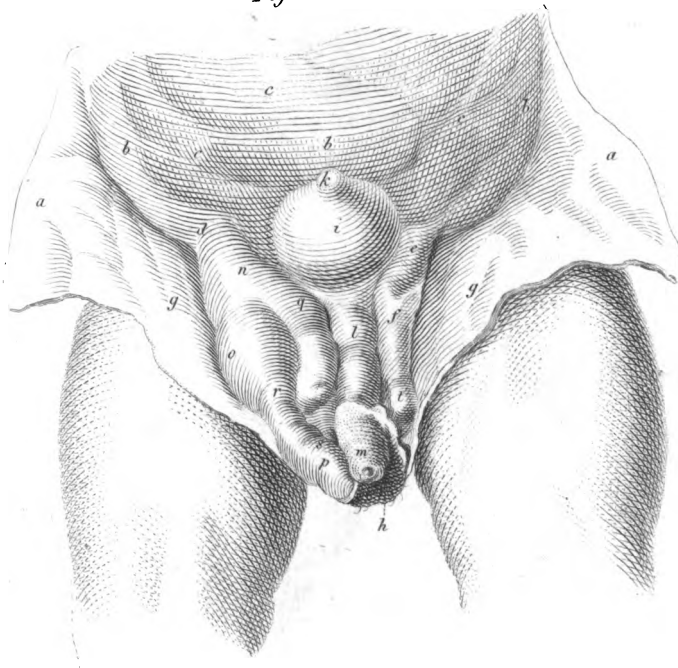


Fig 2



Milton sculp.

Fig. 1.



Fig. 2.



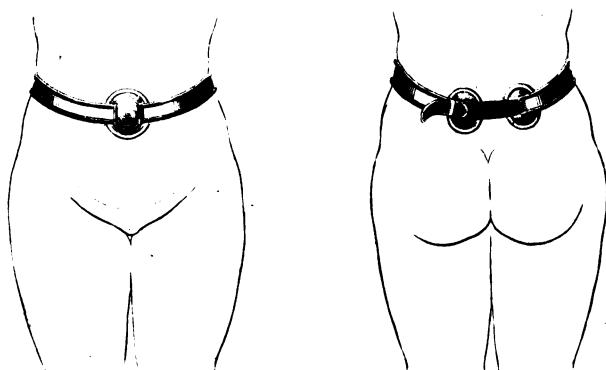


Fig 1.

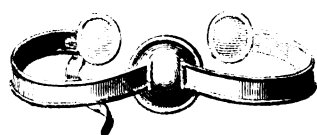
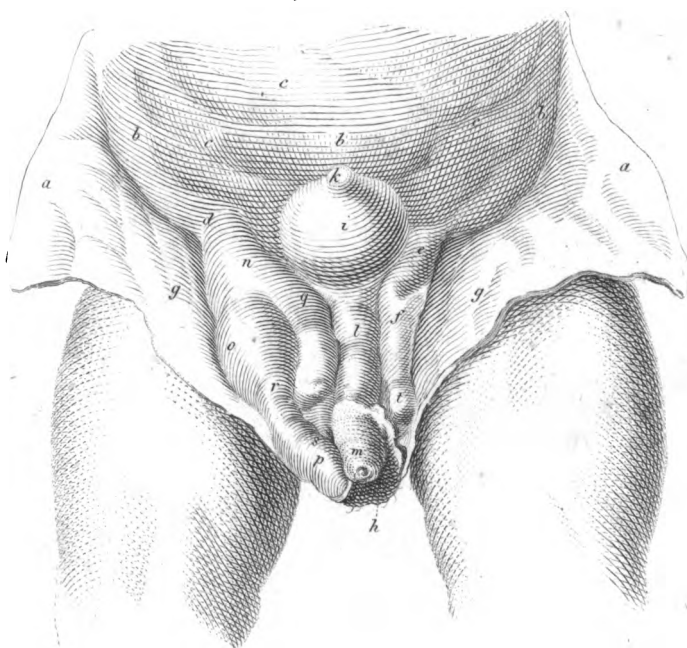


Fig 2



Milton sculp

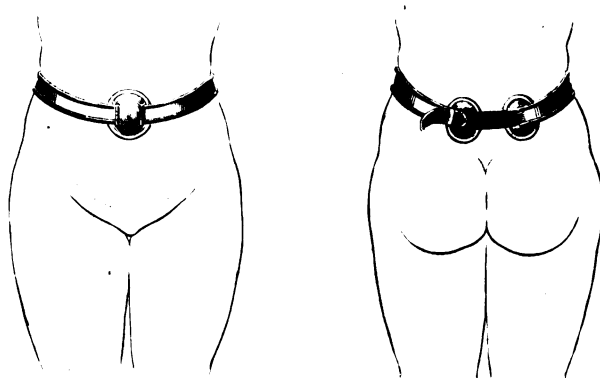


Fig 1.

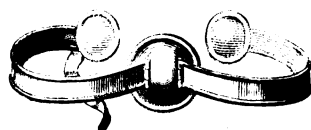


Fig 2

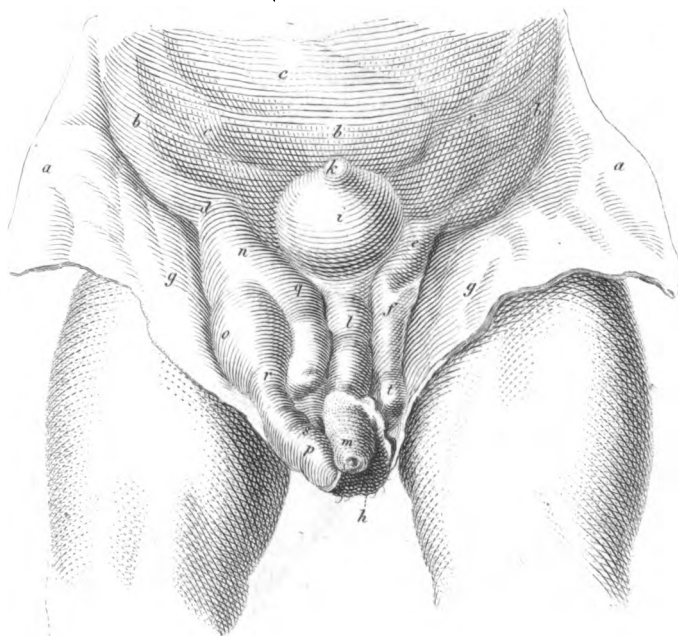


Fig. 1.



Fig. 2.



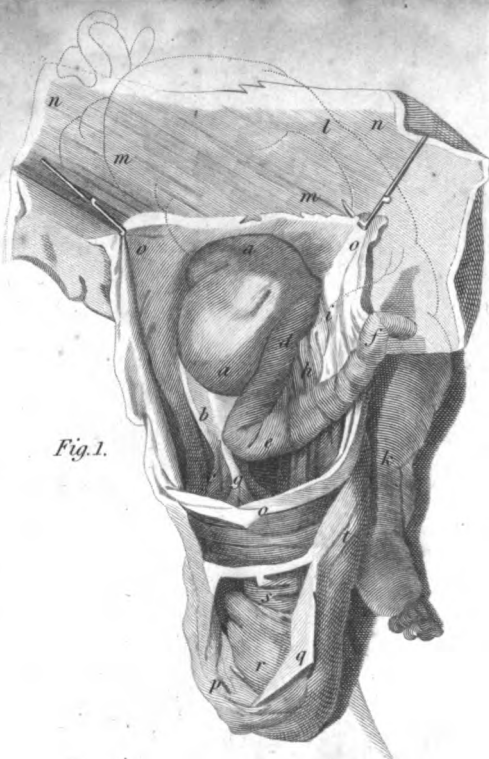


Fig. 1.

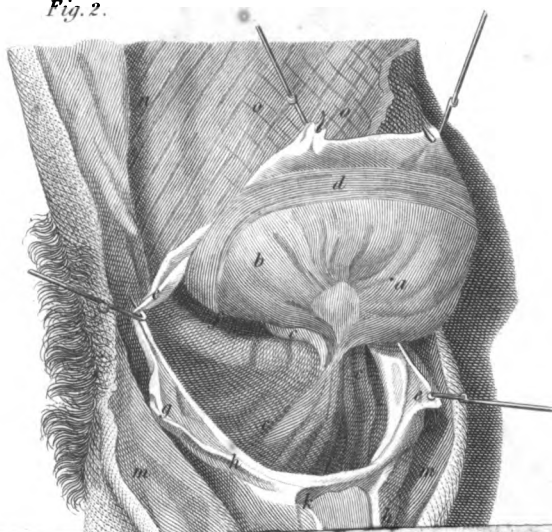


Fig. 2.

